

UNDERSEA WARFARE

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In a Class of its Own

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Multi-Mission Capability of the U.S. Submarine Force

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UNDERSEAWARFARE

THE OFFICIAL MAGAZINE OF THE U.S. SUBMARINE FORCE

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In a Class of its Own

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On The Cover

USS Jimmy Carter (SSN-23) conducts Alpha Sea Trials in November 2004. Jimmy Carter, the third and last of the Seawolf-class fast attack submarines, is outfitted with a 100-foot-long hull extension providing her with a wealth of new capabilities that make it a true multi-mission platform. Jimmy Carter was commissioned February 19, 2005 in Groton, Conn..

Photo by General Dynamics Electric Boat



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“...our Navy must expand its striking power, achieve information dominance, and develop transformational ways of fulfilling our enduring missions of sea control, power projection, strategic sealift, and forward presence.” Our Submarine Force is already addressing many of these challenges and setting the pace as torchbearers for the new, more agile, adaptable Navy.

RDML Joseph A. Walsh, USN, Director, Submarine Warfare

Just as spring marks the season of beginnings, it is only fitting that the Submarine Force enters 2005 in the same fashion. Along with several other important milestones, USS *Jimmy Carter's* (SSN-23) commissioning on Feb. 19 ushered the Silent Service into a new era of adaptable, multi-mission capable warfare. *Jimmy Carter* provides us with new levels of adaptability, with an almost “plug and play” setup, allowing for different mission modules to be easily loaded and offloaded, essentially changing her roles and missions to fit the environment. You can read more about *Jimmy Carter's* commissioning in this issue on pg. 4.

Within *Sea Power 21*, the CNO's transformational vision for the future of the U.S. Navy, ADM Clark states “...our Navy must expand its striking power, achieve information dominance, and develop transformational ways of fulfilling our enduring missions of sea control, power projection, strategic sealift, and forward presence.” Our Submarine Force is already addressing many of these challenges and setting the pace as torchbearers for the new, more agile, adaptable Navy. It is with these directives to meet the current and future challenges of the new security environment that we transition into this new season.

The Submarine Force has a history of innovation that has exploited the inherent strengths of submarines to provide revolutionary warfighting capabilities in response to current or emerging threats. This is no more evident than with the SSGN conversions. This March, USS *Georgia* (SSGN-729), the fourth and final SSBN to SSGN conversion, began its overhaul and in November of this year, USS *Ohio* (SSGN-726) will enter service as the Submarine Forces' first fully operational nuclear-powered guided missile submarine.

The goal of the U.S. Navy is not undersea superiority, it is total undersea dominance. To this end, we have initiated a resurgence in our commitment to ASW. I recently had the opportunity to brief Congress on several pressing issues facing our Force, the greatest of which are the challenges and successes we have encountered with ASW. As you all know, the seas are not transparent and our potential adversaries continue to exploit this through the development of quieter, less detectable platforms. The Silent Service and the Navy as a whole are confronting these challenges at every available

opportunity with updated strategies, technologies, and knowledge. UUVs will prove to be an important component in ASW; you can read about the Navy's new UUV Master Plan on pg. 10 of this issue.

Many of you are familiar with the Naval Submarine League (NSL), which was established in 1982 to “stimulate and promote awareness, by all elements of American society, of the need for a strong submarine arm of the U.S. Navy”. As a liaison member of the NSL Board of Directors, I can attest that the NSL continues to do this most worthwhile function while providing significant support to myself and my staff in the Pentagon as we work with our Defense and Navy leaders along with the Congress. The NSL has local chapters in all submarine homeports and it provides many worthwhile individual benefits to members such as our quarterly publication *The Submarine Review*, regular e-mail updates, invitations to submarine related symposiums and conferences, and a ready source of submarine related materials for the asking. Finally, it sponsors grants for key undersea warfare research and studies and supports an informative Web site. It is the only organization of its kind and one the Submarine Force and all elements of undersea warfare need!

If you are not already a member, and you are reading these words, you are eligible to join the Naval Submarine League. I recommend that you join the approximately 4,000 current members at a minimal annual cost by contacting the NSL office at (703) 256-0891 or by visiting their Web site at www.navalsubleague.com. The NSL is for everyone interested in submarines and undersea warfare, be they civilians, active duty or reserve officers and enlisted, or retirees.



In keeping with UNDERSEA WARFARE Magazine's charter as the Official Magazine of the U.S. Submarine Force, we welcome letters to the editor, questions relating to articles that have appeared in previous issues, and insights and "lessons learned" from the fleet.

UNDERSEA WARFARE Magazine reserves the right to edit submissions for length, clarity, and accuracy. All submissions become the property of UNDERSEA WARFARE Magazine and may be published in all media. Please include pertinent contact information with submissions.

Send submissions to:

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dear **EDITOR,**

I have just finished reading RADM John P. Davis's article on USS *Jimmy Carter* ["USS *Jimmy Carter* (SSN-23) Expanding Future SSN Missions," UNDERSEA WARFARE, Fall 1999]. It was most informative. Again thanks for a very well-written article and I will look forward to using your Web site in the future for news on the Navy Submarine Fleet. By the way, I was a Sailor aboard the USS *Proteus* (AS-19) and have always felt that submarine Sailors deserve more credit for their work than they usually get.

How might a civilian obtain a photo and other material from the commissioning of the *Jimmy Carter*? Any information will be appreciated.

Regards,
Larry Arnett

Dear Mr. Arnett,

Thank you for your interest and taking the time to write. Many high-resolution photos of *Jimmy Carter*'s commissioning are posted on COMSUBGRU-2's Web site at www.csg2.navy.mil/jimmycarterphotos.htm. Many other photos of submarines, ships, Sailors, and operations, are posted on the Navy NewsStand Web site. You can view these photos by visiting www.news.navy.mil/index.asp.

dear **EDITOR,**

It is timely that the Fall 2004 issue of UNDERSEA WARFARE is the first that I have seen since VADM "Big Al" Konetzni was Commodore of Squadron 16, when I was stationed aboard USS *John C. Calhoun* (SSBN-630) in Kings Bay, Georgia. VADM Konetzni was one of the finest leaders in the Submarine Force and the Navy, inspiring many future leaders and fine Sailors. He will be missed.

Brian A. Christiano
LT, USN (Ret.)

dear **EDITOR,**

I enjoyed the article on periscopes in the Fall issue ["Eyes From the Deep," UNDERSEA WARFARE, Fall 2004]. It was well written.

Two additional items if I may.

First, the Type 4 scope installed late in WWII, had a radar as well as more light-gathering power for night use. The radar solved the significant problem of range to the target in periscope depth attacks.

Secondly, shortly after WWII, the Submarine Conference in Washington, whose membership included many WWII submarine skippers, developed a list of desirable capabilities for periscopes – power train, variable height, monocular, binocular, still camera, movie camera, bearings in field of vision, and so forth. The Office of Naval Research awarded development contracts to Kollmorgen and Bausch and Lomb. The scopes were a thing of beauty with all the desired capabilities. As I recall, at least one was installed in one of the new fast-attack boats. However, a problem was quickly recognized – the scope had very poor light transmission, even less than the Type 2.

Lesson to be learned: Look at the downside of any "improvement".

Max C. Duncan
CAPT, USN (Ret.)
USS *Barb*, WWII

CAPT Duncan,

Thank you for your insightful feedback. We passed along your comments to the author of the periscope article and he enjoyed them as well, particularly your discussion of the post-WWII Submarine Conference. Your letter provided some interesting insight we don't often receive. Again, thank you for your letter, it is truly appreciated.

dear **EDITOR,**

I was visiting your Web site www.chinfo.navy.mil/navpalib/cno/n87/mag.html, and I think it is a great site. I am honored to have been on a submarine myself and I think all the Sailors who are on one now or have been on one are the best in the Navy. I salute them.

Lewis Groome

dear **EDITOR,**

How can I get a subscription to UNDERSEA WARFARE Magazine?

Kevin Loewe
EM2(SS)

EM2 Loewe,

Thank you for your interest in UNDERSEA WARFARE Magazine. There are two ways to obtain a subscription.

1) Visit the Government Printing Office's (GPO) web site at <http://bookstore.gpo.gov/> and entering "UNDERSEA WARFARE" in the search box.

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sailors**FIRST**



Photo by J02 Corwin Colbert

Students from Clayton, Ohio's Northmont High School Navy Junior Reserve Officers Training Corps (NJROTC) learn how submarines use sonar while submerged. The NJROTC group visited the nuclear-powered attack submarine USS *Greeneville* (SSN-772) during a class trip to Pearl Harbor on Feb. 17.

UNDERSEAWARFARE

The Official Magazine of the U.S. Submarine Force

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UNDERSEA WARFARE is the professional magazine of the undersea warfare community. Its purpose is to educate its readers on undersea warfare missions and programs, with a particular focus on U.S. submarines. This journal will also draw upon the Submarine Force's rich historical legacy to instill a sense of pride and professionalism among community members and to enhance reader awareness of the increasing relevance of undersea warfare for our nation's defense.

The opinions and assertions herein are the personal ones of the authors and do not necessarily reflect the official views of the U.S. Government, the Department of Defense, or the Department of the Navy.

Contributions and Feedback Welcome

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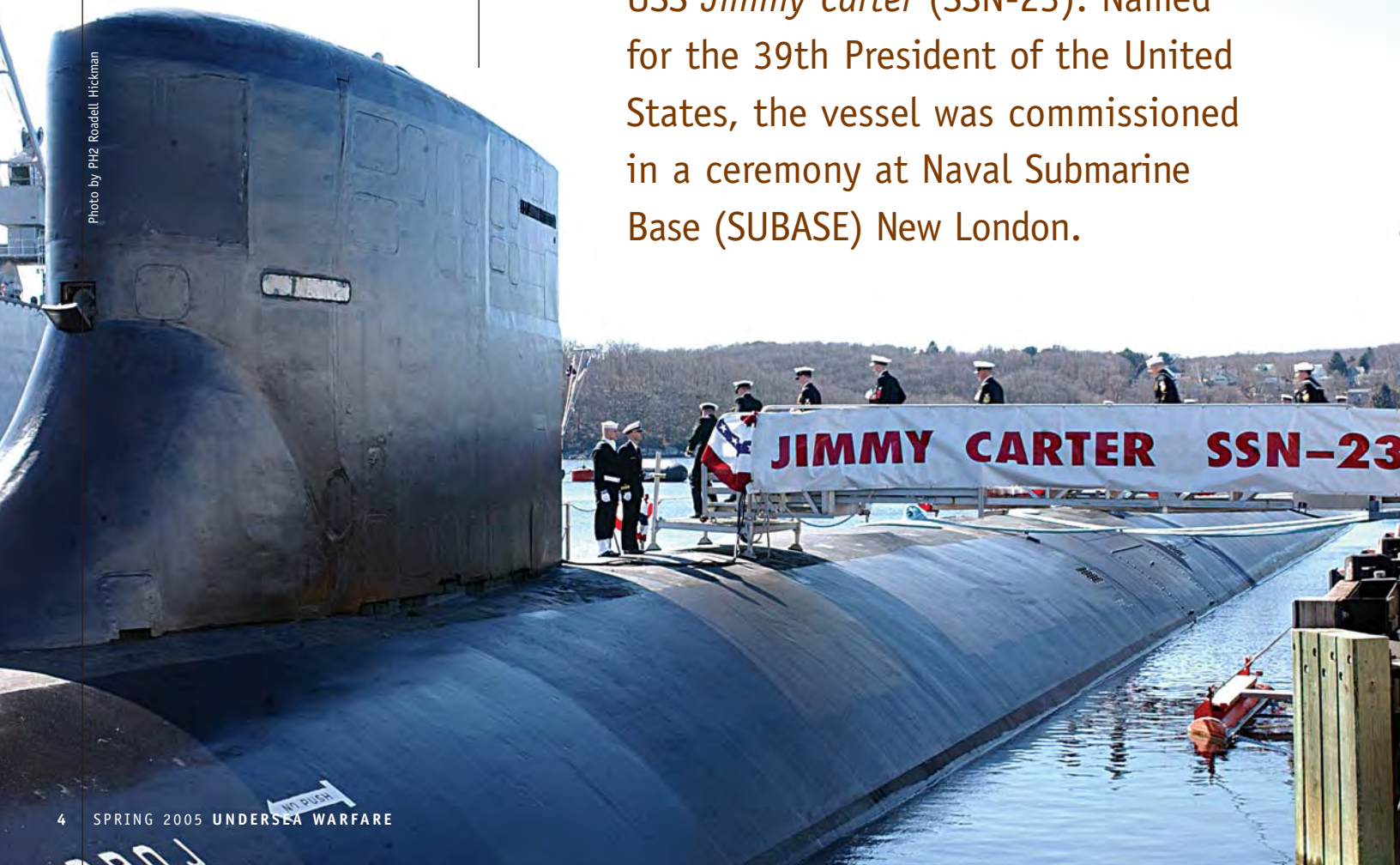
Photo by PH2 Roadell Hickman



(above) CAPT Robert Kelso, Commanding Officer of the USS *Jimmy Carter* (SSN-23), addresses the crowd during *Carter's* commissioning event Feb. 19 in New London, Conn.

(below) Members of *Jimmy Carter's* crew race aboard the ship during her commissioning event.

Photo by PH2 Roadell Hickman



In a Class of its Own

USS *Jimmy Carter* Commissioning Increases
Multi-Mission Capability of the U.S. Submarine Force

Sailors raced aboard the world's newest, quietest, and most heavily-armed nuclear-powered, fast-attack submarine Feb. 19, to "bring to life" USS *Jimmy Carter* (SSN-23). Named for the 39th President of the United States, the vessel was commissioned in a ceremony at Naval Submarine Base (SUBASE) New London.

The ceremony began with an enthusiastic, rousing welcome from Congressman Rob Simmons (R-CT), after which the crowd settled in for a series of congratulatory speeches from local and visiting dignitaries and military and industry leaders.

The third and final submarine of the USS *Seawolf* (SSN-21)-class, *Jimmy Carter* can sail under the polar ice cap or through near-shore shallow water armed with cruise missiles, mines, torpedoes, unmanned undersea vehicles, surveillance sensors, and Naval Special Warfare forces.

The one-of-a-kind vessel has all the capabilities of a *Seawolf*-class submarine, plus a 100-foot-long, 2,500-ton hull extension known as a Multi-Mission Platform to test new generations of weapons and support Navy SEAL operations. In addition to using this versatile ocean interface, the vessel can be equipped with a Dry Deck Shelter and can operate the Advanced SEAL Delivery (ASDS) System.

"Although *Jimmy Carter* is technically the third ship of the class, the modifications make it a class of its own," said Electric Boat (EB) President John P. Casey. "In that sense, the Navy and Electric Boat achieved an unprecedented accomplishment: the commissioning of two lead submarines (*Jimmy Carter* and USS *Virginia* (SSN-774)) in just 120 days."

Although much was said about the capabilities of the new submarine, VADM Charles L. Munns, Commander, Naval Submarine Force, U.S. Atlantic Fleet, used his time at the podium to challenge *Jimmy*

Carter Commanding Officer CAPT Robert D. Kelso and his crew.

"*Jimmy Carter* has much to contribute to the global war on terrorism, to the stability of this nation, and to the safety of our people," said VADM Munns. "The United States of America is in need of her service and I charge you and your crew to make her ready."

President Carter, accompanied by ship's sponsor and former first lady Rosalynn Carter, watched pierside among 2,400 people, including Navy Secretary Gordon England and retired ADM Stansfield

(clockwise from top) CAPT Kelso, escorts former President Jimmy Carter as they pass attendees during the commissioning ceremony.

Secretary of the Navy Gordon England speaks to the audience during the commissioning ceremony.

Former President Carter and ship's sponsor Rosalynn Carter react to a speech during the commissioning event.



Photo by PH2 Roadell Hickman



Photo by PH2 Roadell Hickman



Photo by PH3 Kyle McCloud

Former President Jimmy Carter Tours Namesake Sub

by J02 Barrie Barber, USNR

Former President Jimmy Carter toured the new U.S. Navy submarine named after him at Naval Submarine Base New London on Feb. 18, 2005.

The Nobel Peace Prize winner and former submarine officer said having the world's most advanced fast-attack submarine named in his honor ranked among the highest tributes in his storied life. "I don't think I've ever had one that was more emotionally gratifying to me than to have this ship named after me," he said.

The president, ship's sponsor Rosalynn Carter, and members of their family met with the crew and dined in the wardroom aboard USS *Jimmy Carter* (SSN-23). The former commander in chief presided over a reenlistment ceremony and pinned newly-earned "dolphins" – designating submarine qualification – on one of the ship's officers.

The crew eagerly awaited the former president's visit, just before the Navy commissioned the *Seawolf*-class vessel Feb. 19, said LTJG Julian Bradley, *Carter's* supply officer. "It's a lot of fun because he's one of America's renowned figures," noted Bradley. "We worked so hard. It means a lot that he can come down and spend some time with us."

"A lot of people are excited," said crew member Electronics Technician 2nd Class Frank Kotlarsic Jr. "They've never met a former president."

LTJG Andrew Spencer, who received his dolphins from the submarine's namesake, felt a kinship with the former commander-in-chief. Like Carter, LTJG Spencer graduated from the U.S. Naval Academy. "I got to shake President Bush's hand at graduation, so this is a really neat add-on to that," said LTJG Spencer.

Carter administered the reenlistment oath to Senior Chief Storekeeper Travis Tovar, a Port Washington, Wisconsin native. "Incredible," said SKSC Tovar, a Sailor for 18 years. "It was probably one of the best things I've ever done in the Navy."

Carter has made it a habit to write personal letters to each crewman as he reaches a professional or personal milestone, such as advancement in rate or the birth of a child. Submariners share a bond of mutual dependence that draws them together, the former president explained. President Carter has "taken a keen interest in the ship," said LCDR Todd Cloutier, executive officer and a Scottsdale, Arizona native. "It's quite an honor."

As the ship's sponsor and as a former Navy wife, Rosalynn Carter told a gathering later that she feels the same "close kinship" with the crew as her husband does. "They are enthusiastic and dedicated to their country, and we're very proud of them," she noted.

J02 Barber serves in the Public Affairs Office for Commander, Fleet Forces Command.

(right) Crew members of *Jimmy Carter* help bring the ship to life as they prepare to head across the brow.

Turner, director of the Central Intelligence Agency under the former commander-in-chief and principal speaker at the event.

"This is a great day for the Navy; it's a great day for the nation; and it's a great day for a great president," said Turner.

Turner, a U.S. Naval Academy classmate of the former President, told the crew to look at the submarine's namesake as a symbol of devotion to duty and the American ideals of liberty, human rights, and democracy throughout the world.

"Be proud of the fact that your ship is named for Jimmy Carter," he said. "Because where Jimmy Carter stands out over all the presidents I've known in my life, is in the model that he carves for both being an effective president, while also showing the world what the United States stands for in values, integrity, morality, and unselfish compassion for others in the pursuit of peace."

"As you sail this ship, never forget that the name of your ship, tells the world that the United States does care for others; that the United States does what it deems to be right; that the United States lives up to its word; and that the United States' role in the world is based on morality and a quest for peace," said Turner.

After Turner finished his speech, the Navy officially commissioned the new ship. CAPT Kelso reported aboard as Commanding Officer, Executive Officer LCDR Todd J. Cloutier set the first watch, and Navigator LT Stephen Karpi assumed the first watch as Officer of the Deck. After the first duty section established itself, President Carter – the man of the hour – took the podium, lauding the sub's construction.

"This ship exemplifies the finest aspect of the work of Electric Boat. Rosalynn and I, in the last few years, have watched the miracle of design and engineering as *Jimmy Carter* has begun to come to life," said the former President. In addition to thanking everyone for their contributions, most notably the crew, Carter got more personal.





Photo by PH2 Roadell Hickman

"I've been honored in my life to be the governor of a great state; I've been honored in my life to be president of the greatest nation in the world; I've been honored since then with my role in the Carter Center for our work with peace around the globe; but the most deeply appreciated and emotional honor I've ever had is to have this great ship bear my name," said Carter.

Fittingly, President Carter, who trained in nuclear engineering, is the only White House chief executive to have served as a submariner. He was the senior officer on the Pre-Commissioning Unit *Seawolf* (SSN-575) in the 1950s.

The former President said the Navy and the submarine promote peace and stability through strength in the defense of freedom and democracy. "We don't go to sea to go to war," said President Carter, "We go to sea to preserve peace."

Later this year, the 151-member crew will sail the 453-foot-long, 12,139-ton submarine to its West Coast homeport, Naval Base Kitsap, Washington, to join the U.S. Pacific Fleet.

J02 Barber serves in the Public Affairs Office for Commander, Fleet Forces Command; J03 Steven Feller serves in the Public Affairs Office for Commander, Navy Region Northeast.

(right) Former President Carter is interviewed alongside CAPT Kelso following a luncheon aboard the submarine.

"Jimmy Carter has much to contribute to the global war on terrorism, to the stability of this nation, and to the safety of our people," said VADM Munns.



Photo by PH2 Roadell Hickman

NUWC's Experiment in Connectivity Yields **LARGE** Pay Off for SCC

Traditionally, Submarine Multi-Mission Team Trainer (SMMTT) systems at shore-based Fleet Attack Centers have supported only those torpedo variants that have been approved for warfighting and deployed in great numbers. This presented a problem to Submarine Command Course (SCC) students who received their shore-based training on an SMMTT but were then required to exercise more “advanced” torpedo configurations during their at-sea trials. These later torpedo configurations represent the next set of torpedo operational improvements targeted for release to the fleet in the Torpedo Advanced Processor Build (APB) cycle, and they are employed during SCC and other fleet exercises to gather as much real-world, in-water data as possible while providing the fleet with a useable exercise weapon. Significant savings have been achieved over the years by combining these missions. Because of these configuration differences, however, shore-based trainers have not been able to prepare SCC classes completely for their at-sea exercises.



Pictured here are many of the demonstration participants: from left to right, Shelley McInnis, LT Greg Walters, CAPT Ken Swan, LCDR Joe Baldi, Tom Wohlgemuth, Don Katyl, CAPT Arnold Lotring, Dave Robertson, Steve Wernicki, Laura Rabenold, Dick Lemish, and Eric Spigel.

To address this issue, Naval Undersea Warfare Center Division Newport's (NUWCDIVNPT) field representative at the Submarine Learning Center (SLC) facilitated several meetings to assess options with SLC and the NUWCDIVNPT Undersea Weapons Systems and Combat Systems Departments. A number of alternatives were considered to improve the situation, and after much discussion and analysis, the group decided to integrate torpedo hardware and the most recent versions of operational software into the SMMTT. CAPT Arnold Lotring, SLC's Commander, identified this approach as the fastest and “highest-fidelity” way to satisfy SCC type training, while also supporting torpedo APB software initiatives. To accomplish this objective, the Hardware-In-The-Loop (HWIL) Weapons

Analysis Facility (WAF) at NUWCDIVNPT would need to be "connected" to an SMMTT location. With a sound systems concept and implementation approach in hand, the two NUWCDIVNPT technical departments collaborated in providing a local "WAF-to-SMMTT" networking demonstration.

Within six weeks, the two departments successfully completed a proof-of-concept demonstration in which the SMMTT and WAF were interconnected to show that SCC training could be accomplished by linking SMMTT to an updated torpedo running the latest software. On June 10, 2004, CAPT Lotring witnessed a successful trial that replicated a typical ASW scenario incorporating ownship systems, a torpedo launch, and a high-fidelity simulated target – a KILO-class conventionally-powered submarine. The WAF weapon was a MK 48 Mod 6 torpedo, and SMMTT modeled the ownship CCS MK 2 BLK1C Mod 3 Combat Control System (CCS). Two torpedoes were "fired" from the SMMTT. The first run successfully detonated on the target with no intervention. Because the second run included target evasion maneuvers, wire guidance commands were issued, causing the weapon to execute numerous in-water course changes.

As a result of the successful demonstration, NUWCDIVNPT agreed to assess connectivity issues and provide a second proof-of-concept demonstration between the WAF at NUWCDIVNPT and an SMMTT system at SUBSCOL, to occur during a Submarine Command Course in October 2004. With assistance from Newport Division's Ranges, Engineering, and Analysis Department and the Computer and Information Services Department, the required connectivity was successfully achieved between NUWCDIVNPT and SUBSCOL on October 6, 2004 and exercised in high-fidelity weapons training on October 25-26. During the demonstration, several ASW and ASUW scenarios were modeled that included wire-guidance and countermeasures situations.

In addition to the two NUWCDIVNPT Departments, SLC, and SUBSCOL, the overall effort also involved several weapon-system program sponsors, including PMS 404 and SEA07L1. The basic concept evolved out of a number of past multi-department collaborations at NUWCDIVNPT, which provided the building blocks that

were combined to effect a timely improvement for the fleet. This allowed for training on the new torpedo software earlier than ever before possible. The SLC and SUBSCOL believe that the use of the WAF will be especially valuable to SCC and Pre-Deployment Training at both Groton and Pearl Harbor. Networking the WAF with the SMMTT at SUBSCOL demonstrated the potential of a unique capability to train on the latest torpedo software during the same timeframe in which the new software was being downloaded into the weapons.

Connecting WAF to the SUBSCOL

trainers allows SCC classes to train with both advanced weapon variants and unparalleled acoustic modeling of the target and environment. This capability not only supports SCC training with the same torpedo configurations on land and sea, but it also provides an excellent test bed to preview Weapon System and Combat Control improvements before expensive at-sea firings. The demonstrated connectivity will greatly facilitate and expedite the delivery of solutions to the fleet.

Mr. Wernicki is an electronics engineer for the Naval Undersea Warfare Center, Newport, RI.

SubLAN Increases USS *Buffalo*'s Operational Capability, Quality of Life

by J02 Corwin Colbert, USN

USS *Buffalo*'s (SSN-715) crew is upgrading its Local Area Network (LAN) during a modernization period to be completed in April.

The new estimated \$1.5 million LAN system called, SubLAN 1 will replace the submarine's old system.

According to Senior Chief Electronics Technician Tony Smith, who helps coordinate and plan SUBPAC's C5I modernization, the majority of submarines have at least the Tactical Information Distribution System (TIDS). This nearly \$422,000 system is the standard for networking onboard nuclear submarines.

USS *Buffalo* is one of the few non-TIDS boats. Nevertheless, this will make the submarine not only catch up with the rest of the fleet, but also make it the first Pacific Fleet submarine to have SubLAN 1.

According to the SubLAN 1 Design Review, SubLAN offers answers to problems found in TIDS such as insufficient server rack space, cooling for future operating systems upgrades, and slow network connectivity. The operating system is upgraded to Windows 2000. It also connects into the submarine's fire control systems making its interface user-friendly with Windows-based applications.

CDR Murray Gero, commanding officer of *Buffalo*, said the upgrade will improve capability from an operational standpoint. The upgrade includes installing a high data-rate antenna and other equipment, allowing better communication with operational commanders.

"With the upgrade, I can now do what most of the other warfighters can do, and that is talk and e-mail in real time either on scene or en route to the scene," said Gero.

Buffalo's LAN administrator, Fire Control Technician 1st Class Jason Smith, said SubLAN would improve quality of the workspace environment and quality of life. With better communications, user-friendlier applications, e-mailing, and web browsing for the crew, everyone receives a little benefit.

"With the new network, accessibility will be easier with the addition of more ports and 58 laptops distributed to the crew," said Smith.

"I no longer need to go to different workstations to fix problems because everything is centralized," he said.

According to Smith, the upgrade of all SUBPAC subs is a multi-million dollar reality in the making.

"We started in December of 2004 with *Buffalo* and expect to finish the last boat in 2008," Smith concluded.

by PH2 Richard Brunson



Navy Unveils UUV Master Plan – New Capabilities, New Vehicle Classes

(above) A Battle-Space Preparation Autonomous Underwater Vehicle (BPAUV) is prepared for launch from the High-Speed Vessel *Swift* (HSV-2) during exercise Rim of the Pacific (RIMPAC) 2004. The BPAUV, a program being developed by the Office of Naval Research and the Program Executive Office for Littoral and Mine Warfare, is aimed at developing UUVs capable of performing a variety of tasks in the littoral.

Building upon a vision first published in 2000, the U.S. Navy has released an updated *Unmanned Undersea Vehicle (UUV) Master Plan*. The new master plan offers detailed insight into nine capabilities that analysts have associated with UUVs: intelligence, surveillance, and reconnaissance; mine countermeasures; anti-submarine warfare; inspection and identification; oceanography; communication and navigation networking; payload delivery; information operations; and time-critical strike.

The Navy has conceived four classes of UUVs, each offering advantages in the nine capability areas. The four classes include man-portable vehicles weighing less than 100 pounds; lightweight vehicles of 500 pounds; heavyweight vehicles of

3,000 pounds; and large vehicles weighing 20,000 pounds. These classes of UUVs will evolve as workhorses of the fleet, deploying and retrieving sensors and other devices; gathering, transmitting, and acting on all types of information; and engaging submarine, surface, air, and even land targets.

"UUVs and the mission capabilities these systems will deliver are integral components of naval transformation," said CAPT Paul D. Ims, the Navy's unmanned vehicles program manager, with the Program Executive Office for Littoral and Mine Warfare. "The *UUV Master Plan* outlines a pathway ahead that will develop and expand technologies critical to this nation's ability to overcome the broad area-denial threat."

As a guide for the military and its industry

partners, the *UUV Master Plan* provides a strong case for a balanced investment in technologies to reduce acquisition risk and speed the development of new capabilities. Key technologies include energy-efficient power supplies and reliable autonomous behavior and navigation algorithms. The plan also alludes to investment opportunities in sensors, communications, and data processing payload packages.

Looking to the future, the Navy will expand the roles of unmanned systems, teaming with other platforms and systems in mine warfare operations and other high-risk activities associated with shaping the battle space. For example, during Operation Iraqi Freedom, UUVs worked alongside Marine Mammal Systems and other coalition-force assets to clear mines from the approach lanes of the Iraqi port, Um Qasr. Newly maturing technologies may provide more advanced UUVs with the ability to detect, classify, and neutralize mines from a single vehicle.

Unmanned systems across all operational domains are becoming mainstays for building a joint-force intelligence, surveillance, and reconnaissance architecture. Data acquired from this architecture are key elements of Chief of Naval Operations ADM Vern Clark's concept for "persistent, pervasive" knowledge dominance in the littoral battle space and beyond. UUVs provide critical information for naval force protection and coastal and harbor monitoring, and in the future may be equipped to detect and localize weapons of mass destruction.

UUVs increasingly will support anti-submarine warfare (ASW) operations, according to the new master plan. Various types of vehicles may be employed to "hold at risk" an adversary's submarine operations—by sensing and cueing joint-force and coalition platforms and weapon systems, as well as by providing long-term area monitoring. In the future, UUVs may be called upon to perform submarine track and trail—and perhaps even to attack targets.

The Navy is also studying alternative offensive roles for UUVs, such as emitting jamming or false data transmissions into an adversary's command, control, and communications network. The *UUV Master Plan* also envisions the eventual development of UUVs armed with land-attack weapons to provide time-critical strike capability.

The plan highlights another important,

inherent capability of unmanned systems: that of serving as communication and navigation network nodes (CN3). The significance of this capability lies in the UUV's ability to act as a bridge interface between above-water radio communications, high-bandwidth, long-range networks, and lower-bandwidth, below-water transmission systems.

As CN3, unmanned vehicles may provide additional redundancy for GPS and other position location systems. UUVs may also relay communication signals from various emitters—such as local radios and satellites—providing connectivity for forces operating clandestinely or in remote areas. As networking nodes, sharing and relaying data, UUVs may assist the Navy's submarine force in achieving communication capability "at speed and depth."

With unmanned systems gaining importance across all domains, the Navy's 2004 *UUV Master Plan* details the road ahead for defining the capabilities of four new classes of undersea vehicles, and the operational contributions these vehicles bring to enhance the nation's maritime dominance. Of particular interest to the science and technology community and to industry, the new plan also evaluates areas for continued investment in areas that will realize the once-futuristic vision of UUV operations.

The *UUV Master Plan* can be found online at www.chinfo.navy.mil/navpalib/technology/uuvmp.pdf

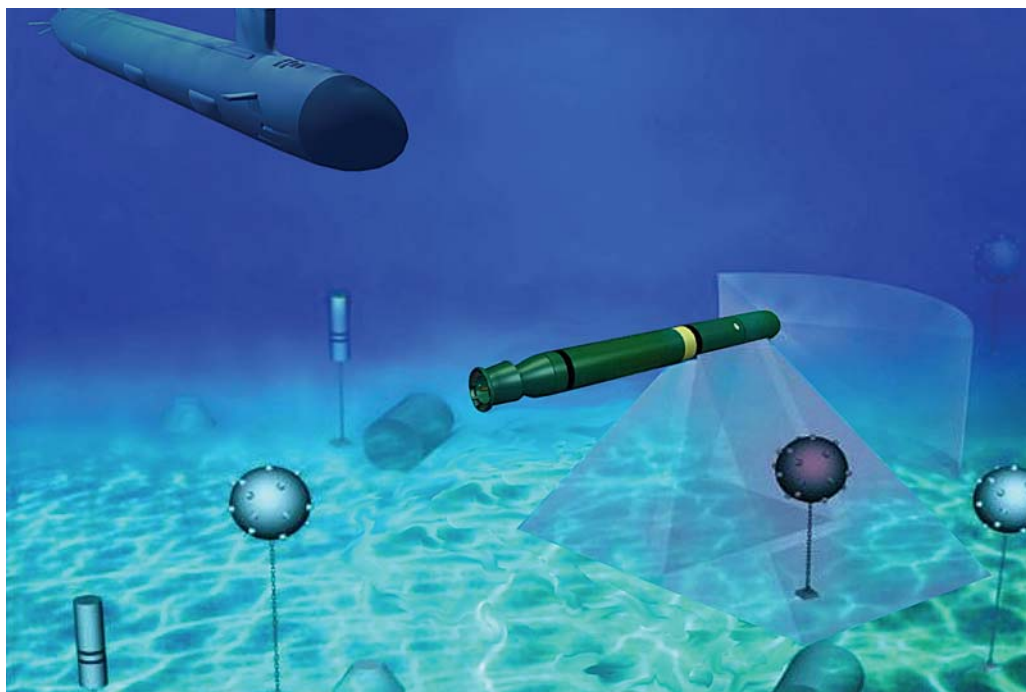
Mr. Keeter is an analyst with Anteon Corporation in Washington, D.C.

Photo Courtesy of Office of Naval Research



(above) REMUS is an example of commercially-developed UUV technology that has been applied to military operations. In 2003 off the Iraqi port city, Um Qasr, the U.S. Navy employed REMUS vehicles alongside Marine Mammal Systems during mine countermeasures operations.

(below) An artist's representation of the concept of operations for the Long-term Mine Reconnaissance System. Designed for launch and recovery from a submarine's 21-inch diameter torpedo tubes, the LMRS will conduct clandestine mine countermeasures and act as a fleet training and experimentation asset for further development of more complex UUVs with greater autonomy and mission payload flexibility.



A Training Vision for the Information Age of Warfare

"Write down the vision clearly upon the
tablets, so that one can read it readily"

- Habakkuk 2:2

Like it or not – be comfortable with it or not – the Information Age of Warfare is here, and it challenges every previously-held assumption that we depended on during the Industrial Age of Warfare. The ongoing “Revolution in Training” has forced the shore training community to make an honest assessment of the state of training today and to use sound analytical processes to determine the changes needed to shape a training strategy for the Information Age of Warfare.

The Submarine Learning Center has completed a bottom-up review of the knowledge, skills, and abilities needed by our Sailors to plan a continuum of learning for their entire career. Following the Human Performance System model prescribed by the Human Performance Center, we have completed our analysis, identified gaps in performance, and are currently drafting new solutions. The Submarine Learning Center is now ready to propose a new training vision for the future.

The Forcing Functions of Change

As the submarine community entered the Information Age of Warfare, a series of obvious changes began to affect the assumptions that defined training during the Industrial Age. These are:

Accelerating rates of technology insertion and increasing rates of information availability. This will require a more highly-trained and capable work force with access to a training system that can react to yearly changes of technology and information.

Flatter command and control organizations that must be self-organizing. This change will require more emphasis on the ability of individuals to learn how to organize as teams and rapidly process information for actionable knowledge.

Greater automation of platforms and their functionality. This will change the effective number of required operators and the skills required of them.

Increased cross-functionality and commonality of equipment. This will continue to reduce the need for a number of traditional ratings.

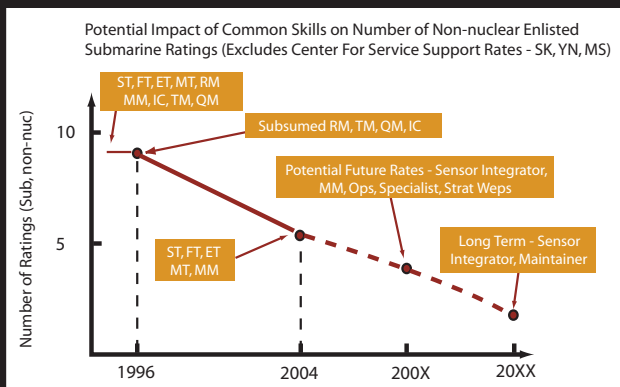
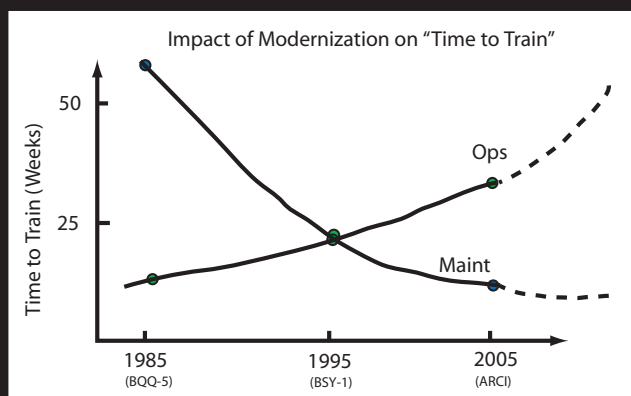
Reduced equipment maintenance requirements. This will reduce crew sizes and the skill sets required for equipment maintenance.

The Indicators of Change

An accompanying figure shows the dramatic decrease in the training hours required to prepare operators to successfully repair the AN/BQQ-5 sonar system in 1985, as compared to the AN/BQQ-10 Acoustic Rapid COTS Insertion (ARCI) system of 2004. It is clear that the introduction of advanced digital COTS-based systems, with their increased reliability, has decreased the need for extensive repair training. The primary training emphasis is now shifting to operations, because the systems offer enhanced capabilities to process, analyze, and display information. This again is a result of the Information Age, in which the ability to process information becomes a defining skill.

The second illustration shows how ratings have been consolidated in the Submarine Force as a result of recognizing the changing skill sets of our Sailors and the shift to a higher level of technology and operator capability. As equipment has become less domain-specific and more common across application areas, engineers have looked for opportunities to design-in

(right) Impact of Modernization on Time to Train - Sonar Technician Example



(left) Potential Impact of Common Skills on Number of Submarine Non-Nuclear Enlisted Ratings

efficiencies by simplifying architectures and using common components. Additionally, automation has removed many of the more intensive rating-unique skills – such as determining torpedo presets, which was once done with mylar overlays – thus allowing a steady decrease in the number of distinct enlisted ratings. Critical for this approach to rating consolidation, however, is a clear understanding of the remaining skills still required and assurance that they will be delivered to the operators. We have only to look back at the consolidation of the Quartermaster rating that recognized the shift to digital navigation, but failed to appreciate the need for maintaining navigational planning skills in the consolidated rating.

The Current State of Enlisted Training

The present training continuum fails to address adequately the new environment of the Information Age. The training uses a segmented approach in which learning events are staged around enlistments, with time intervals between schools lasting up to five years. This contrasts starkly with the fact that because of rapid COTS insertion strategies, new hardware and software can be introduced yearly. Also, the emphasis continues to focus largely on developing individual skills and not on the integration of individuals into teams. In fact, the youngest of our crew members may not be part of a tactical team until after their first few months onboard the ship, probably much too late for assimilating their newly-learned skills into a team environment. Increasingly, for submariners, the defining skill set for success in the Information Age of Warfare will be the ability to participate successfully as team members to solve

problems, as opposed to the rating-specific skills of the past.

A Training Vision for the Information Age of Warfare

A new training vision is needed to ensure that our undersea warriors have the right skills at the right time. Our vision for the future is to take full advantage of the common skill sets that our Job Task Analysis has identified during the construction of the Five Vector Models (5VM). These common skill sets provide an opportunity for all apprentice or entry-level Sailors to train together on high-quality training products, which present learning objectives consistently and with the same measures of success. The rate-specific skills needed onboard our ships are still fully covered but with a topic focus that leads to a “team-training milestone event.” These milestones will be assessment events that will require the students not only to demonstrate their rate-acquired skills but also to validate their integration and performance as team members. Our ability to train and evaluate Sailors in teams early in their careers is now possible because of the tremendous investment by OPNAV N779 and NAVSEA 07L in our family of shore-based trainers, including SPAN-2000, the Common Operations Acoustic Employment Trainer, and Submarine Multi-mission Team Trainers. Once in place, our new strategy will allow for common apprentice-level training for our FTs, STs, and ET navigation operators. Besides ensuring the right training is determined, the immediate pay off is Sailors are ready to integrate into the ship’s tactical teams as soon as they report onboard. The next drawing is a

depiction of this new training strategy with milestone events for maintenance, piloting, and underway steaming, plus a capstone event of section tracking.

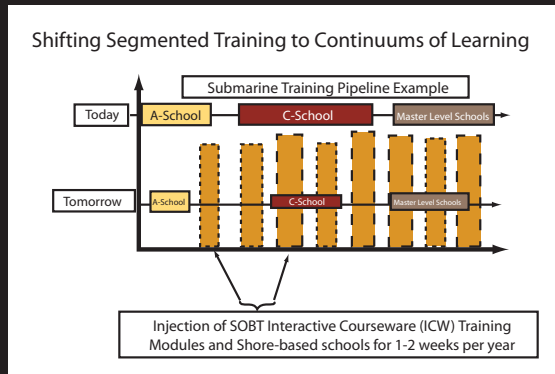
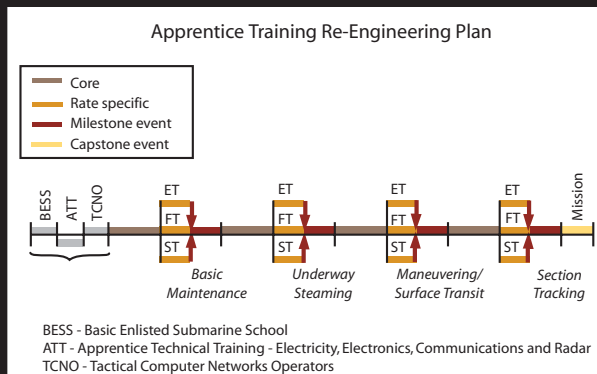
Beyond apprentice-level training, the strategy will shift from the current, segmented approach of “C” schools and master-level courses to a “continuum of learning.” To address the very real challenge of constant technology injections, the professional development vector of the 5VM will provide yearly learning opportunities one to two weeks in length. The delivery of these modules might be provided by Submarine Onboard Training (SOBT) products, by on-line Web-based media, or short courses in our homeport schools. The effect of this strategy will be a shortening of long formal courses such as “C” schools and master-level training. This approach will offer greater flexibility to deliver the right training, at the right time, to the right person. As an example, the final figure shows this new continuum of learning for the Sonar rating.

The time has come to put in place the changes needed to create the common preparatory foundation and ensuing continuum of learning required of our undersea warriors under Sea Power 21. These training changes are aligned with the Human Capital Strategy promulgated by the Commander, Naval Submarine Forces (COMNAVSUBFOR) and necessary for its success. Delaying their implementation would leave in place an approach that is no longer responsive or adaptable to the needs of our undersea warriors in this new Information Age of Warfare.

CAPT Lotring is the Commanding Officer, Submarine Learning Center in Groton, Conn.

(right) Apprentice Training Re-Engineering Plan for Submarine FT, and ET Ratings.

(far right) Submarine Training Pipeline Example of Transition to Continuums of Learning from Segmented Training



USS *Scranton* Brings Submarine's Vision to MBGIE Exercise



Photo by PH1 Gloria McCoy

The fast-attack submarine USS *Scranton* (SSN-756) demonstrated that submarines are an integral part of the Navy's strike and battle group framework during its participation in the Multi-Battle Group Inport Exercise (MBGIE), Feb. 7-11.

This was the first time joint (Army and Air Force) and coalition forces used the Navy's Continuous Training Environment infrastructure and Joint Forces Command's Joint Training and Experimentation Network for training, and *Scranton* was a key element of the exercise's success.

"This exercise was fantastic training for the full crew," said LCDR John Newton, *Scranton*'s executive officer.

The MBGIE scenario encompassed 56 hours of continuous wartime planning

and execution, and allowed participants the opportunity to train at all levels, promote coordination between warfare commanders, execute joint and combined battle force operations, and familiarize their crews with real-time joint and combined operations in a high tension, combat environment.

"It's an example of network centric warfare, fighting a simulated regional crisis," Newton added.

Scranton's crew utilized the Attack Center One (AC1) trainer at the Submarine Learning Facility (SUBLRN-FAC), located a short distance from the pier where they were moored. AC1 is configured to exercise submarine crews in anti-submarine warfare, anti-surface

LTJG Joe Campbell performs a surface scan at the Attack Center One trainer at the Submarine Learning Facility, Norfolk, Va., during Multi-Battle Group Inport Exercise (MBGIE). Campbell is assigned to USS *Scranton* (SSN-756), the only submarine to participate in the joint exercise.

warfare, and all aspects of strike planning and execution, including Engagement Planning, Command and Control, Mission Data Update (MDU) Operations, Strike Execution and Casualty Response.

SUBLRNFAC is the premier schoolhouse for exercising submarines in Tomahawk strike warfare. The true distinction in SUBLRNFAC's ability to train the fleet lies in its ability to train submarine teams in warfare command and control.

The "realism" of the trainer made for a more realistic exercise for the *Scranton* team.

"It's an 'around the clock' exercise, with full watch teams and reliefs," Newton added. "Though nothing can replace at-sea training, MBGIE provided an excellent opportunity for focused training to meet a specific objective," as well as demonstrating the interoperability of the submarine force at all levels of strike group work-up and deployment.

A diverse and joint exercise like MBGIE allowed joint U.S. and coalition forces to better integrate themselves into the battlespace, to become a much more effective fighting force. This is especially crucial for the submarine force.

"Exercises like MBGIE highlight the strengths of the submarine, showing the fleet what submarines can bring to the table," Newton said.

"This exercise was fantastic training for the full crew."

— LCDR John Newton, *Scranton*'s executive officer

British Royal Navy Lt. Cmdr. James Buck, representing the UK battle staff embarked aboard the amphibious assault ship USS *Kearsarge* (LHD-3), participates in MBGIE.



Photo by PH2 Greg Roberts



Emory S. Land's Crewmembers Put
New Perspective
on 'Shore Duty'

Sailors Help Armor Army Vehicles

On Feb. 4, the goal of the Army's 276th Maintenance Company in Kuwait was to add additional steel protection, or up-armor, 300 vehicles before the close of business. That single-day total wasn't going to set the bench mark for production, though; it was just a day's work. In January alone, the 276th and its companion company up-armored 6,600 vehicles in a production system that Chief Warrant Officer Randal Joeckel called "an Army factory."

(opposite page) HT3 Jessica Curtis, welds side-panel armor for a U.S. Army 5-ton truck at Camp Buehring, Kuwait.

(below) USS *Emory S. Land* (AS-39) is a forward-deployed submarine tender, homeported in La Maddalena, Italy, that provides logistical support and repairs to all Sixth Fleet surface and submarine assets.

Welders keep torches hot

To remain efficient "we have to keep our welding rods and cutting torches hot," said Army Maj. John Murillo, the support operations officer of the 158th Combat Support Battalion, the higher command of the maintenance companies.

In less than three months, the three maintenance companies involved in up-armor work in-theater – the 175th, the 276th, and 699th maintenance companies – used 12 tons of welding rods and 124,000 hardened bolts to fashion \$27 million worth of ballistic steel sheets into doors and panels to help keep soldiers safer while on convoy missions.

"We canvassed the unit for machinists and wrecker operators, and we trained them all to be metal workers in a couple of weeks," Joeckel said. "Then came the big push to get all vehicles hardened. We have never denied a vehicle yet that is headed north. I can't say enough of my soldiers."

Even with Army machinists and welders working around the clock, they couldn't keep up with the demand.

Then came the Navy with a team from USS *Emory S. Land* (AS-39).

Navy sends hull techs to help

When the Navy was asked to provide a crew to help its Army counterparts, it wasn't short on volunteers, said LTJG Chris O'Leary, the crew's officer in charge. The 15 slots were quickly filled.

"We thought this was a great opportunity, and we took it. And, we would take another one," said O'Leary, who spent 11 years as



Photo by J03 Jared Hill

an enlisted machinist's mate before earning his commission.

The crew members are hull technicians and have the same kind of training and skills that Army machinists and welders possess.

A volunteer crew arrived in Kuwait in late January, and they were put to work immediately after undergoing Joeckel's cross-training program.

Hull Maintenance Technician Seaman Apprentice Brett Jones had seen enough of the water and was ready for a change. Jones came to Kuwait from *Emory S. Land* stationed in Italy.

"We've got a lot of work to do out here, more than we thought," Jones said. "We've

been working our butts off out here, and we're enjoying it."

Sailors' doing ship-shape job

"We don't have any Humvees, but we do structural work, and the welding is not much different than on ships," O'Leary said. "The 276th has a process and they showed us. We picked it up fast."

The Navy's impact was felt immediately when its senior chief petty officer made a suggestion for modifying one of the steel panels used for larger trucks. It was a design change that found its way into the template and has been used since.

The Navy hull technicians also came

with an advantage, said Murillo.

"We're treating them like a brigade welding team even though they will only be here 45 to 60 days," Murillo said. "But there is a little better teamwork because [the Sailors] have no other interest. They are here purely doing machine work."

But Hull Maintenance Technician 2nd Class Roddey Zinda said he volunteered for one reason: "It's a respected job and it's my trade, and I know I am good at it. And if I can help ... it just made sense."

Officers get hands dirty too

All hands on the crew work on the 24-hour shift, including O'Leary, whose face was streaked with sweat and the soot of spent welding rods.

"When you see the officer and the senior chief working with the crew, it boosts morale," Zinda said, "and shows us how important this is."

The crew landed in Kuwait near the end of January during a rain storm that turned much of the desert into a temporary flood plain. Making that entrance even more memorable was a communication gaffe that sent their personal luggage back to Italy, and then Germany, before it found

Photo by Sgt. 1st Class Tammy Jarrett



Maj. Gen. Stephen Speakes, director of Force Development for the Office of the Deputy Chief of Staff of the Army, explains the Level II add-on armor kit on a humvee to media at the Pentagon. The add-on armor kit is similar to the armor the sailors from *Emory S. Land* installed in Kuwait.

its way to Buehring, which is a few miles south of the Iraqi border.

Soldiers helped out by providing a few creature comforts and the essentials, from toothpaste to razor blades.

The Sailors noticed

"This is a lot of hard work and under arduous conditions all the time," O'Leary

said. "We're here for 45 to 60 days, but a lot of the [soldiers] are here for a year. I don't know how they do it. It makes us appreciate how good we have it and the sacrifices these people make."

Master Sgt. Haskins serves in the Public Affairs Office for the Army's 377th Theater Support Command.

Photo by Spc. Curt Cashour



HT3 Robert Thompson welds together pieces of side-panel armor for a 5-ton truck. HT3 Thompson normally serves on the USS *Emory S. Land* (AS-39), but he and 14 shipmates volunteered to help with the up-armor mission in Kuwait for about 45 days.



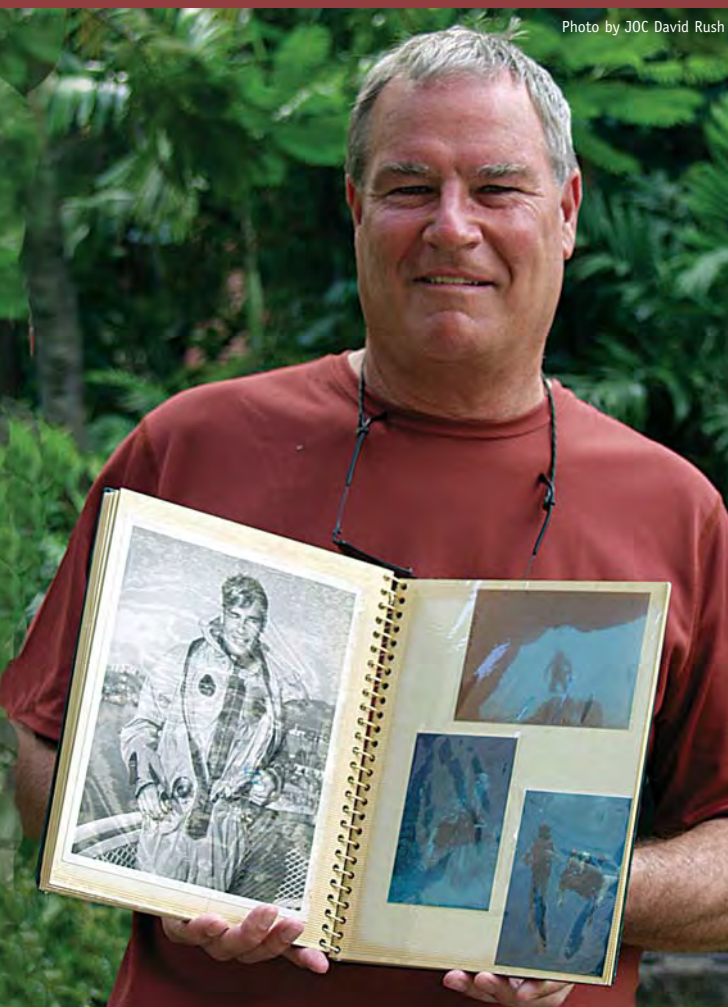
U.S. Navy Photo

Dive Tower Sailor Returns to Hawaii

(above) Former GM2 Mark Branlund (far left) worked as an instructor at the Commander, Submarine, Pacific Dive Tower in Pearl Harbor. Branlund is pictured here, in this undated photo, in the Dive Tower with his fellow dive instructors. The Dive Tower served as an important training tool for submariners from 1932–1983.

Thirty-five years after he trained Sailors how to escape from stricken submarines, a former Navy deep-sea diver returned to Pearl Harbor, where he spent four years aloft, but underwater.

The 100-foot high Dive Tower, located on the former Submarine Base, is no longer in operation, but it once served as an escape training facility for submariners should their submarine suffer a catastrophic casualty at sea.



In addition to teaching survival techniques to submariners, Branlund and his fellow Sailors were the first in the Navy to test submarine survival equipment.

According to retired Gunner's Mate 2nd Class Mark Branlund, his experience here was truly a unique opportunity. "I tried out for UDT (Underwater Demolition Team) but they wouldn't take me because of my eyesight. I ended up giving all of the UDT qualification tests here at the Submarine base and then as an instructor for Seal Teams One and Two, and Marine Reconnaissance and Demolition Teams," said Branlund.

Branlund was also on hand when many celebrities passed through. The Dive Tower was a highlight for the Naval Station Pearl Harbor tour.

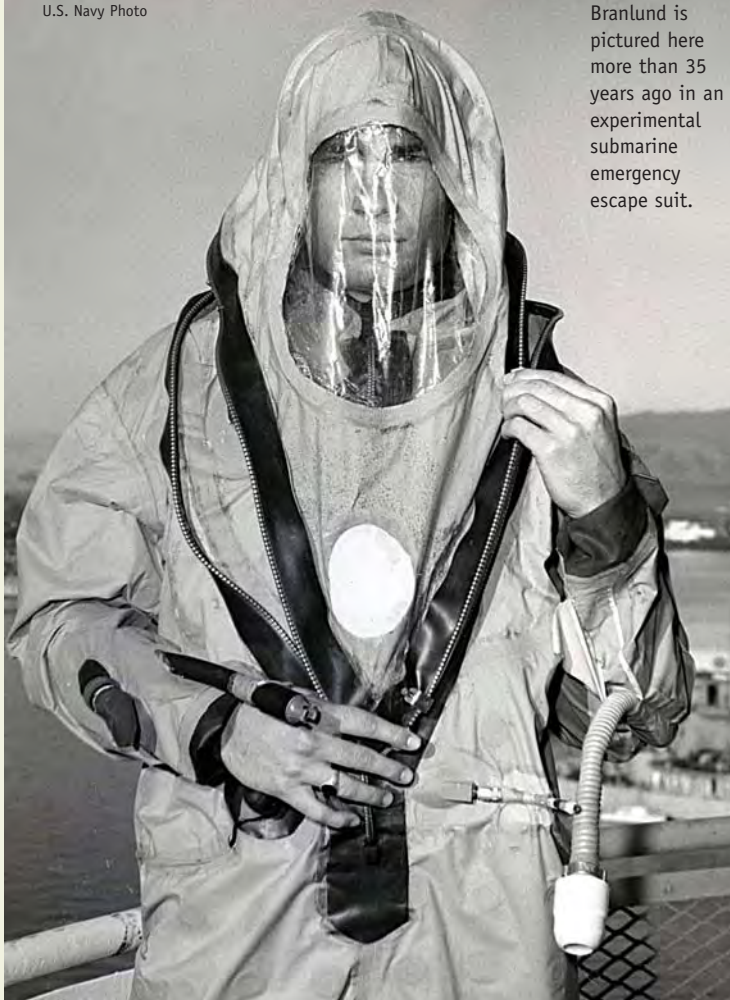
(above) Branlund took time from his vacation to the Hawaiian Islands to return to COMSUB-PAC where he worked as an instructor at the Dive Tower.

(right) The attack submarine USS *Los Angeles* (SSN-688) prepares to depart Pearl Harbor, Hawaii, for a Western Pacific deployment. The Dive Tower can be seen in the background as it appears today.

Photo by JOC Corwin Colbert



U.S. Navy Photo



Branlund is pictured here more than 35 years ago in an experimental submarine emergency escape suit.

"The fun part about my job was that we got to do a lot of the VIP tours. We put on dive tower demos for Elvis Presley and Priscilla, General William Westmoreland, the Royal Crown Prince of Bengal, and a whole bunch of other folks," said Branlund. "I really, really enjoyed my time [at the dive tower]," he added.

In addition to teaching survival techniques to submariners, Branlund and his fellow Sailors were the first in the Navy to test submarine survival equipment.

"We were the guinea pigs to test two different designs of submarine escape suits. They realized the Steinke Hood was not sufficient to protect Sailors from environmental exposure once you reach the surface. The suits we were testing, we would float for four hours at a time in the open ocean," said Branlund.

Although an updated variation of the suit with a one-man raft was approved recently, Branlund noted that an earlier version with the raft was not. "One of the concerns was making a safe ascent if you were unconscious. If you're unconscious

and lying in the water, ain't no way you're getting in a raft," exclaimed Branlund.

Although the real estate developer and businessman had returned to Hawaii before, he didn't have the opportunity to see the tower again until recently. "I have been back to Hawaii twice but I never got the chance to revisit the dive tower like you guys allowed me to do," said Branlund.

Back in the company of Sailors on his tour, Branlund felt compelled to tell a sea story. Branlund and his shipmates discovered they had the power to make it rain when there was no precipitation in the forecast.

"One of the fun things about working for COMSUBPAC was he could never figure out why it was raining when there weren't any clouds in the sky. There was a fill valve in the escape tank and when we allowed it to overflow it came out from the top, and somehow it was always raining," Branlund concluded with a smile.

JOC Rush serves in the Public Affairs Office of the Commander, Submarine Forces Pacific

Pearl Harbor Submarine Diver Training Tower



Built in 1932, the 100-foot tall Pearl Harbor Submarine Diver Training Tower was used for over 50 years to instruct Sailors in submarine escape techniques.

Essentially the tower was a vertical tube filled with water and used to simulate a Sailor's ascent from a disabled submarine. Sailors would don the Steinke Hood in an airlock beneath the water-filled chamber, a flood valve would be opened and the chamber would fill with water until the pressure equaled the pressure at the bottom of the chamber. Once the Sailors exited the airlock chamber, the buoyant air pressure in their Steinke hoods allowed them to slowly rise to the surface.

In 1983, the tower was drained and converted into a crow's nest conference room by RADM Jack Darby. The room atop the tower is called "The House that Jack Built."

MONTURIOL

The Forgotten Submariner

The evolution of the submarine, from its infancy through the American Civil War, enjoys a fairly well-documented, if perhaps not particularly well-known, place in history. The earliest description of how a diver might be supplied with air beneath the waves is found in the writings of Aristotle, who described what is essentially a diving bell. By submerging inside a weighted object shaped roughly like an upside-down bucket, the diver can breathe the air trapped inside. Legend has it that another famous ancient Greek, Alexander the Great, investigated Athens harbor in such a device. Interest in the depths then apparently submerged until the Renaissance. A fifteenth-century Venetian named Roberto Valtino

may have invented a hand-propelled wooden submarine, about which little evidence remains, and Leonardo da Vinci (1452-1519) claimed to have designed a military submarine, but refused to publicize it “on account of the evil nature of men who practice assassination at the bottom of the sea.” Da Vinci’s prejudicial view against submarines as tools of war seems to have been shared by many officials and navies even into the latter years of the nineteenth century.

In the mid-sixteenth century, Englishman William Bourne published the first account to deal with a submarine’s quintessential feature: buoyancy control. Forty years later, in 1623, a Dutch inventor in the court of King James I named

Cornelius Drebbel put Bourne’s design to practice in the Thames, purportedly rowing submerged for several miles. About a century and a half later, American submarine design debuted with David Bushnell’s *Turtle*, which he and George Washington hoped would help even the naval playing field in the American War of Independence between the almost-nonexistent American fleet and the powerhouse British Royal Navy. The egg-shaped craft was unsuccessful in the world’s first submarine attack on another ship, HMS *Eagle*, and was later lost while under transport. Americans Robert Fulton (who was later to invent the steamship) and Loder Philips each built submarines that they tried to sell to various governments, with no luck. In 1850, a Prussian soldier named Wilhelm Bauer built a submarine with a metal hull powered by men on a treadmill, which promptly sank during its first trial for the German government. Bauer and his crew survived, but he was forced to seek a buyer elsewhere, ultimately unsuccessfully.

The American Civil War, which started in 1861, produced several roughly comparable primitive submarines, such as the *Alligator* (acquired from a Frenchman) and the *Intelligent Whale* for the Union and two *Pioneers* and the CSS *Hunley* for the Confederacy. Each of these boats sank at least once except the *Intelligent Whale*, which was not delivered until after the war ended. The *Hunley* became famous for being the first submarine to conduct a successful submerged attack when it torpedoed the Union ship *Housatonic*, causing five deaths, but the *Hunley* itself sank during the attack, killing its nine-man crew. The *Hunley* had already sunk twice previously, killing several crewmembers including its namesake inventor.



This photo shows the large port holes on the bow of a reconstruction of Monturiol's *Ictíneo II* in Barcelona.

Thus reads, generally speaking, most histories of early submarine inventors and their designs. History, as it meandered through the years, decades, and centuries, picked these men up and swept them along, preserving their legacy for posterity and future historians. However, one submariner got left behind, his impressive work largely forgotten in the years after his death, his name virtually unknown to modern naval historians. That man was Narcís Monturiol.

Monturiol was born in 1819 in Figueres, located in Spanish Catalonia. Early in his life, he moved to the Catalan capital of Barcelona, where he got caught up with the revolutionary, utopian, and socialist citizens of that city agitating for social justice and political change in Spain, away from a reactionary monarchy. Throughout his life, Monturiol would spend significant amounts of time either engaged in republican activities, or in exile as a reward from the Spanish government for his efforts.

A unique talent Monturiol brought to this movement was a knack for engineering and invention. He believed in technology and science as the answers to mankind's social and economic woes, and he was constantly dreaming up ways to ease the suffering of his fellow man. Once, around 1844, as Monturiol walked along the beach he noticed a group of Barcelona's coral fisherman gathered around a motionless and nearly-drowned fellow diver. Not one to ignore the plight of another, Monturiol raced over and lifted the man by the legs, allowing gravity to force the water out of the diver's lungs. The fisherman recovered, still clutching the precious coral he had brought back from the bottom of the sea. Later, as Monturiol sat near the same spot with a friend, watching the ships off the cape, a light bulb went off in his head. What if he could build a ship that sailed *under* the water? For starters, the coral divers would be able to reap their harvest in complete safety. He might even usher in a new age of scientific exploration and enlightenment beneath the waves that cover over seventy-five percent of the Earth's surface.

Monturiol kept his idea to himself for a dozen years, out of concern that he would not have the funds to build it and would be ridiculed for the idea. However, a friend he finally confided in convinced him that his idea must be brought to life, and



The *Ictíneo II* reconstruction is seen from the port side.

money could be found from friends and the general public. Monturiol already had a good idea as to the design of the first of what he hoped would be numerous, ever-improving submarines, and had even given it a name, *Ictíneo*, from the ancient Greek *ichthys* (fish) and *naus* (boat). The *Ictíneo* would fully encapsulate its passengers, protecting them from the dangers of the aquatic world while still allowing them to interact with all they discovered. Portholes were to be included so passengers could witness the wonders all around them, and the boat would be equipped with a means of retrieving objects (i.e., coral) and carrying them back to land. It would be able to dive to the very bottom of the ocean, and would operate independently of any surface assistance. In fact, Monturiol went so far as to suggest that the *Ictíneo* would extract oxygen from the surrounding water through fish-like gills. As Monturiol put it, the *Ictíneo*'s "form is that of a fish, and like a fish it has its motor in the tail, fins to control its direction, and swimming bladders and ballast to maintain an equilibrium with the water from the moment it submerges."

Unlike his predecessors, Monturiol undertook an extensive study of all the scientific principles, as understood at the time, which govern undersea travel. He became an expert in oceanography, meteorology, biology, chemistry, physics, and engineering, even conducting his own experiments to gain first-hand knowledge in those subjects. The first challenge Monturiol faced in designing the *Ictíneo*

was water pressure. He realized that if his boat was to reach the depths of the ocean, it would have to be able to withstand crushing pressures. The best type of shape to absorb pressure, Monturiol knew, is a sphere. However, a sphere did not give him the streamlined, fish-like shape he needed for hydrodynamics and steerage. In a stroke of genius, Monturiol decided to keep his fishy hull design, but added a second, interior pressure hull. To fit the outer hull better, he stretched the spherical design into an ellipsoid. Thus, water was allowed between the two hulls, with only the interior hull tasked to withstand the water pressure while the exterior hull enabled the *Ictíneo* to slip more easily through the sea. In addition, Monturiol could locate the ballast tanks and any other equipment interacting with the sea in the free-flooding space between the two hulls.

Monturiol wanted to build his interior pressure hull entirely out of metal to make it as strong as possible, but this was impossible. He and his financial supporters simply did not have the money. Instead he settled for wood, with which Monturiol was intimately familiar through his father's profession as a cooper, and which was readily available in Barcelona. He built a cylindrical barrel out of olive wood, supported with oak rings and sheathed in two millimeter-thick copper. This hull measured four meters long, two meters at its highest, and one meter wide, giving it an interior volume of about seven cubic meters. It could accommodate up to six very close friends. Using the math available

to him, Monturiol figured the pressure hull would maintain its integrity down to 500 meters, although for safety's sake he only rated it to 50 meters. He was, after all, interested in improving human life, not ending it. The outer hydrodynamic hull was seven meters long, two and a half meters tall, and displaced over 10 tons of water.

The free-flooding area between the *Ictíneo's* two hulls provided the ideal space for Monturiol to install four ballast tanks, or, as he called them, bladders. With two located fore and two aft (controlled by valves from inside the pressure hull to admit sea water and pumps to expel it) the inventor now had a means to achieve neutral buoyancy. To actually take his craft down and then back up, he used hand-turned propellers. However, never one to take chances where the safety of his crew was involved, Monturiol installed a back-up system to ensure his submarine could surface even if the bladder system failed. By installing not one but two sets of large detachable weights to the exterior of the boat, he ensured that, by releasing these weights, the *Ictíneo* would be able to immediately increase its buoyancy and rise to the surface should an emergency occur.

Monturiol's design called for another large weight to solve a submarine's inherent battle between its center of gravity and its center of buoyancy. If a submarine is heavier forward than aft (that is, if its cen-

ter of gravity is fore and its center of buoyancy is aft), it will plummet nose first to the bottom. The additional weight, inside the submarine and on a metal track, allowed Monturiol to counter any shifts in the submarine's center of gravity or buoyancy as crew members moved about, the submarine changed its orientation in the water, water entered the ballast tanks, and so forth.

As with his all-metal pressure hull, Monturiol was forced to abandon hopes for steam power, or some other mechanical solution, for propulsion. He simply did not have the money for such a complex addition to his design. Instead, like his predecessors, he relied on human brawn to propel the *Ictíneo* through the sea. As for keeping the crew alive beneath the surface, Monturiol figured that if his boat was to look like a fish, it might as well breathe like a fish. Therefore, he commenced a study of the gills of fish to learn how they extract oxygen from the water. Upon further consideration, however, he determined that since most fish seem to spend their time close to the surface, the ocean's oxygen must be concentrated there. And since his was to be a deep-diving submarine, the gills concept was abandoned. He did manage to develop a way to cleanse the interior chamber of carbon dioxide by pumping air through a container of slaked lime (calcium hydroxide). The carbon dioxide and calcium

hydroxide would react to form solid calcium carbonate, leaving behind air free of carbon dioxide. However, his solution to produce oxygen proved unfeasible because it produced sulfuric acid – not something one wants to share the confined, submerged spaces of a submarine with. Monturiol decided to let the problem wait and contented himself with limiting dives to the length of time it took the *Ictíneo's* crew to use up most of the available oxygen. He also had to settle for a mundane solution to the question of interior illumination, resorting to a simple candle. This used up precious oxygen, but had the advantage of turning a deep red and alerting the crew as oxygen started to run out. To explore the underwater world, he installed several large glass portholes on the sides, top, and nose of the *Ictíneo*. These were thick and semi-conical, so water pressure would push them into the hull and seal off potential leaks.

On the morning of June 28, 1859, with his submarine association's funds largely depleted, Monturiol was finally ready to take the *Ictíneo* on her maiden voyage. The thought, technical expertise, and flair of genius that went into its design were unprecedented in the annals of underwater travel. This large wood and copper fish, as with its inventor, was well ahead of its time. As a gaggle of Monturiol's family, friends, investors, and fellow utopians watched along the pier at Barcelona's harbor, the *Ictíneo* slipped down the guide rails, and crashed into the water – directly into hidden underwater pilings. Monturiol quickly determined that full repairs would completely exhaust his funds, so he opted to perform a quick fix to the damaged portholes, exterior hull, and ballast tanks, and limit dives to twenty meters.

Several hours later, the *Ictíneo* was ready for another try. Monturiol and his two crewmembers, an old business partner and his lead shipbuilder, sealed themselves in



Photo by Dr. Stephen Wood

(left) An up-close view of the modern reconstruction as it stands near the harbor in Barcelona.

the boat and started cranking the propeller. A safe distance from the dock, the *Ictíneo* stopped, and then slowly submerged amidst a froth of bubbles. The surface calmed, leaving no trace of the odd-looking contraption. Twenty minutes passed, as the anxious crowd strained for some sign that all was well with the submariners. Suddenly, the water boiled up again and the *Ictíneo* breached the surface. The hatch opened, and out came Monturiol, arms raised in triumph. The “fish boat” lived.

Over the course of that summer in 1859, Monturiol took the *Ictíneo* on more than 20 test dives, gradually increasing depth to his self-imposed 20-meter limit. He constantly monitored the performance of the whole boat, and the living conditions inside it. He learned that the crew could remain submerged for around two hours with only the oxygen sealed inside the boat. Their endurance could be doubled with the use of bottled oxygen

and the carbon dioxide purifier. The *Ictíneo* proved to have good handling in the water, but its human-powered top-speed was disappointing. Nevertheless, by the end of that summer, Monturiol enthused that “After the successful trials of my first *Ictíneo*, which is no more than an experimental prototype... it is no exaggeration to assert that, henceforth, man can

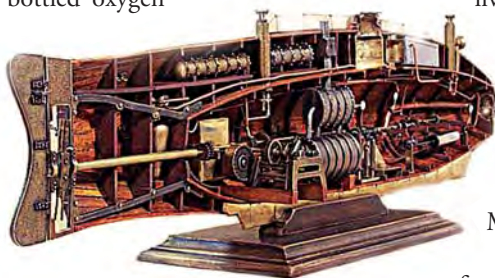
dominate the entirety of the solid crust of our globe, for he has in his hands the means to transport himself to any depth in the Ocean.”

Unlike many of his predecessors and antecedents, Monturiol did not conceive of his invention as a tool of war. Given his socialist and utopian tendencies, it is hardly surprising he would be more concerned with the plight of local coral-divers than the armament of nations. However, eventually the realities of public funding caught up to him, and as the donations dried up, he felt forced to turn to the government of Spain for help. Even as the *Ictíneo* plied the waters of Barcelona’s bay, Monturiol was planning an improved second submarine named, appropriately enough, *Ictíneo II*. To the Spanish Navy, Monturiol conceded that his boats could have military value, but of course only as a defensive weapon that could save Spanish

lives. The Navy, however, did not share his enthusiasm for the project.

It pledged support to Monturiol, but did so with no intention of following through. Monturiol and his friends redoubled their

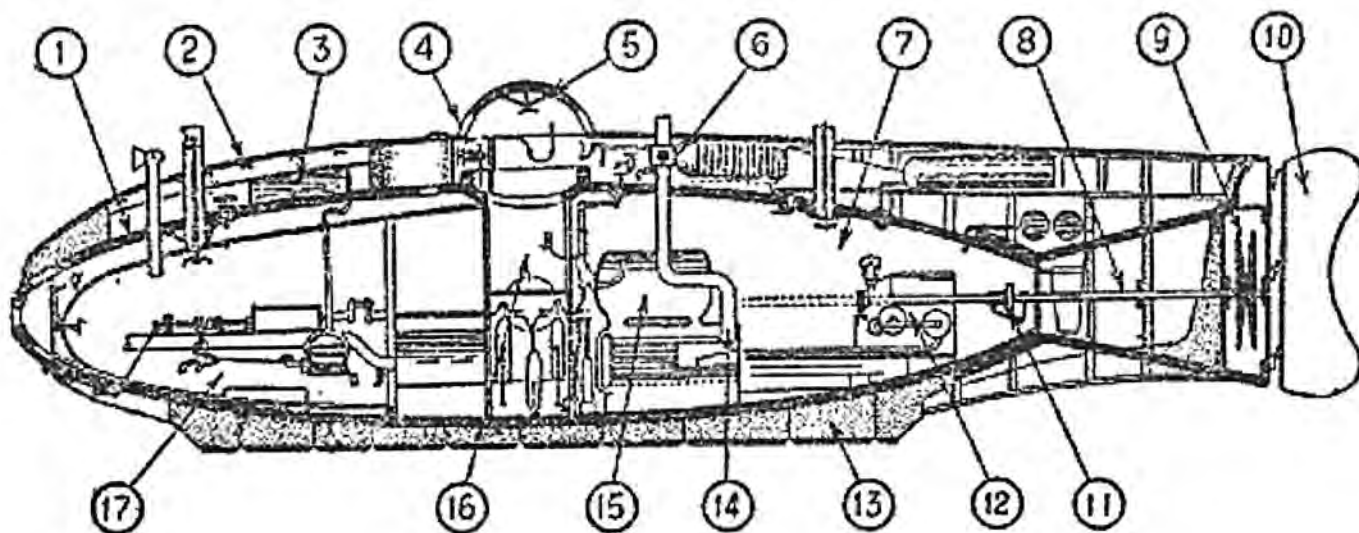
fundraising efforts, and eventually were able to build his improved submarine. Before work on the boat even began, though, the original *Ictíneo* met its untimely demise January of 1862, after some fifty dives, when a wayward freighter ran into it while it was



(above) This photo shows the unique rudder and protected propeller of the *Ictíneo II*.

(left) Designed for a crew of 20, conditions aboard *Ictíneo II* were cramped as evident in this cross-section model.

(below) This graphic illustration highlights some of *Ictíneo II*’s important and revolutionary features such as double hull construction (1,2), dual engines (12, 15), and emergency ballast (13).



berthed. Monturiol was of course crushed, but the loss only intensified his desire to build his second submarine.

Slightly larger than its predecessor (designed for a crew of twenty), the *Ictíneo II* boasted improvements in virtually every aspect of its design and featured an underwater chemical search lamp, retractable pincers for plucking objects out of the sea, better life-support systems, and separate ballast tanks for both trim and depth control. The *Ictíneo II* took her maiden voyage on May 20, 1865, submerging to a depth of 30 meters. Some months later, in a final effort to secure government funding, Monturiol installed a cannon atop the *Ictíneo II*, which could be aimed and fired from inside. Several unannounced demonstrations in the bay did nothing to attract the funding he wanted, but they did run him afoul of the harbor's authorities. Upon reading of the American Civil War and the far cruder efforts at undersea locomotion across the Atlantic (including the CSS *Hunley*, which, as one Confederate quipped, "would sink at a moment's notice and sometimes without it"), the financially-strapped Monturiol wrote to the American Secretary of the Navy. Unfortunately for Monturiol's bank account, the Civil War had ended by the time the Secretary got around to his response.

Throughout his career as a submarine inventor, there was one problem that continued to haunt Monturiol: inanimate propulsion. He calculated that three knots was the slowest an ocean-going vessel could go and still be able to safely overcome the

currents and tides, but it seemed human muscle, no matter the size of the crew, was incapable of these speeds. He needed a motor. Working about twenty years before the inventions of reliable electric and internal-combustion motors, Monturiol's only option was steam power. But contemporary steam engines were heated by an open flame, which is fine for a surface vessel that can expel exhaust and replenish oxygen easily, but this was not an option for a submarine. So Monturiol returned to his chemical experiments, mixing thousands of concoctions until discovering that a solution of 53 percent zinc, 16 percent manganese dioxide, and 31 percent chlorate would generate enough heat to power the engine, while also producing oxygen. He purchased a six-horsepower engine and divided it in half. The larger portion he left as a coal-burning engine for surface propulsion, while the second was given a separate boiler for the chemical mixture. The chemicals were stored in 15 rod-shaped cylinders, which were inserted into the boiler to induce the reaction. At long last, Monturiol felt he had found the answer to the question of underwater propulsion. Alas, two major hurdles remained: actually getting the engine inside a submarine, and of course money, Monturiol's bane.

In Monturiol's dreams, he saw yet another new submarine, purpose-built to house his new chemical steam engine. It would be much larger to accommodate all the necessary parts and pipes, and it would be built entirely out of metal, a much better conductor of heat than wood. The engine would also be housed in its own separate, climate-controlled area of the boat. Of course, given the dire financial strait of Monturiol's submarine association, building another submarine was pure fantasy. A more realistic, but certainly still expensive, alternative was to shoe-horn the engines into the *Ictíneo II* and install an array of bronze pipes in the submarine's interior, through which seawater would be pumped to carry off the engine's massive heat output. He was able to scrape together the funds to get the two engines into his second *Ictíneo* (without the cooling system) during the first half of 1867, but then he was forced into one of his several exiles at the critical moment. Three months later it was finally safe to return, and on October 22, 1867 the *Ictíneo II* made its

first surface journey under steam power. The submarine averaged 3.5 knots with a top speed of 4.5 knots, enough for Monturiol's minimum requirements. Two months later, on December 14, he took the boat under the waves and ran the chemical steam engine, but didn't attempt to go anywhere. Two weeks later, on December 23, Monturiol's submarine association went completely bankrupt, having finally exhausted all of its funds. The main creditor called in his debt, and, unable to pay, Monturiol was forced to surrender his only asset, the *Ictíneo II*. The creditor subsequently sold the submarine to a business man whom Monturiol hoped would use the vessel for its original purpose of harvesting coral. But even this was not to be, as the authorities, who taxed all marine vessels, decided that the *Ictíneo II* fit that description and issued its new owner a tax bill. Rather than pay, he dismantled the entire submarine and sold it for scrap.

For over a decade, Monturiol had pursued his dream of making undersea travel, exploration, and – as finances dictated – warfare, a reality. Through the trials of fiscal woes, intermittent exiles, and enormous technical challenges, Narcís Monturiol applied a mind unique in history to sustaining life under the waves. Both *Ictíneos* were decades ahead of their time, in everything from their double-hull design and life-support systems to the *Ictíneo II*'s dual engines, which apparently would have performed admirably had the inventor had the funds to properly utilize them. After the final crushing defeat of watching his second submarine dismantled and scrapped, he faded into obscurity, condemning future submarine inventors to retread the paths he had so painstakingly pioneered.

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[Note: The latter reference is the only scholarly English-language source for information on Monturiol and his submarines known to the author. All quotes are from this work.]



A memorial to Narcís Monturiol stands in downtown Barcelona.



MCPON visits Pearl Harbor Submarines

Discusses Hot Button Issues with Sailors

by J02 Corwin Colbert, COMSUBPAC Public Affairs

Master Chief Petty Officer of the Navy (MCPON) Terry Scott spent the afternoon with the crews of USS *Louisville* (SSN-724) and USS *Buffalo* (SSN-715) on Jan. 31.

Scott said he wanted to spend some time with Sailors in the Pacific Fleet, where he answered questions on uniform issues, advancement, and the future of the Navy.

The hot topic of the day was the possible change to Navy uniforms. Scott said the Navy is considering new uniforms after surveys showed personnel dissatisfied with the current versions. Navy officials are testing four working uniforms and four service uniforms. Input from the enlisted and officer communities was taken into consideration when developing the new uniforms.

Scott said a key aim of the uniform changes is to reduce the overall size of the sea bag. The quality of uniforms is also being evaluated. For instance, the current utility uniform is designed to last six months. The new working uniform is designed to last 18 months. According to the MCPON, what is left in the sea bag should be practical.

"One of the things I was always frustrated with was that our uniforms do not effectively protect us from the elements we face," he said.

The crews then asked what came next in the evolution of future rate testing cycles. He said there are two different groups working on various concepts. The exam center in Pensacola, Fla., has been working on an automated version of advancement exams. The idea was developed to test Sailors on actual knowledge of the rate instead of trivial questions.

Another group is determining if a fully mature Five Vector Model can be used to develop a competency-based exam. Basically, all the vector categories would be combined to create a score that would be stacked against other scores.

"This past September the Navy had the first web-based exam for 100 Aeroographer's Mate Seaman. Instead of the normal written exam, they were presented different weather conditions and other visually-based material. This way they were being tested on their skill," said Scott.

Photo by J02 Corwin Colbert



Master Chief Petty Officer of the Navy (MCPON) Terry Scott addressed the crew of USS *Buffalo* (SSN-715) on various issues, such as uniforms, advancement, and the future of the Navy. Scott visited the nuclear-powered attack submarine on Jan. 31.

MCPON emphasized the results may be a combination of the two ideas and would take some time before it is actually implemented. Rushing the idea would be disastrous, according to the MCPON.

"We are talking about 320,000 Sailors' careers. That is not something we want to mess with," he said.

He then addressed the five-year sea, two-year shore rotation proposal. He explained the Navy would become more sea-based and that there was a need to keep Sailors focused on the skills they acquired. There would still be some shore duty billets for jobs such as 'A' school instructors and recruiters.

"The purpose of this proposal is to get away from general shore duty billets where Sailors are doing things outside of their skill set," he said.

Scott, a former submariner, felt at home when boarding the two nuclear-powered attack submarines. As MCPON, it is his job to be "Navy-centric" and not to emphasize any particular community. However, he did mention the importance of the Submarine Force from his own experience.

"Even though our submarines aren't making a visible contribution to the Global War on Terrorism, what they do away from the public eye is absolutely

essential and invaluable to protect our people from terrorists who threaten the democracy that this country was founded on," he said.

FT3 Christofer Framel, USS *Louisville*, briefed the MCPON on the latest fire control systems technology and advancements. After Scott addressed the crew, Framel said it is nice to see people like MCPON come and talk to Sailors directly. He also felt all his questions were answered.

"My main question was about the new uniforms. I was concerned about what were the real reasons for the change and when would the final decision be made," said Framel.

After the visit, Scott had a very important message to deliver to all Sailors.

"Our jobs have a certain degree of risk to them. In addition, as we have seen, not only in Iraq, but in other hazardous areas, these risks are a part of what we do in the Navy," he said. "However, what is most regretful is the loss of life that can be prevented. We lose hundreds of Sailors every year to motor vehicle accidents. I ask every Sailor to take responsibility for themselves and their shipmates to ensure we are not going to lose any more Sailors than we have to," concluded Scott.



Notre Dame Legend Tours USS *Key West*

by J02 Corwin Colbert, COMSUBPAC Public Affairs

The submariners of USS *Key West* (SSN-722) gave a ship's tour to University of Notre Dame legend Daniel 'Rudy' Ruettiger on Feb. 25. Ruettiger was immortalized in the 1993 movie "Rudy", which chronicled his quest to play football for Notre Dame.

Ruettiger travels the country as a motivational speaker. As the guest speaker for the Navy Submarine Ball the following day, he was given the opportunity to tour a submarine. He said it was an offer, "he couldn't refuse."

Key West's commanding officer, CDR Kenneth Sault, greeted Rudy topside before heading down into the control room.

The tour was a relaxed one filled with puns and sea stories from Rudy who understood a lot of the Navy jargon because he had once been in the Navy.

"I was in the Navy in 1969 as a Seaman Yeoman on a destroyer," he said.

The group toured various spaces aboard the nuclear-powered attack submarine including the auxiliary machinery room, torpedo room, berthing, and the crew's mess.

"When the captain showed me the enlisted berthing and then his own quarters. I could not believe he said his quarters were luxurious. I could hardly spread my arms out," said Ruettiger.

After spending an hour on the submarine, it was time to go. However, Rudy said the tour made quite an impression.

"The Submarine Force is amazing.



Daniel "Rudy" Ruettiger (left) chats with USS *Key West's* (SSN-722) commanding officer CDR Kenneth Sault during a tour of the nuclear-powered attack submarine.

People have to see this with their own eyes before they can truly understand what it is about," he said.

Like a true motivational speaker, Ruettiger had a few words to say to all U.S. Navy Sailors.

"I would like to thank Sailors for their dedication. Stick in there. You don't realize what you are getting out of when you decide to leave the Navy and go to the next level. This experience is going to take you a long way," Ruettiger concluded.

The son of an oil refinery worker and third of 14 children, Rudy rose from

valleys of discouragement and despair to the pinnacles of success. Today, he is one of the most popular motivational speakers in the United States. It took years of fierce determination to overcome obstacles and criticism, yet Rudy achieved his first dream – to attend Notre Dame and play football for the Fighting Irish.

As fans cheered RU-DY, RU-DY, he sacked the quarterback in the last 27 seconds of the only play in the only game of his college football career in 1974. He is the only player in the school's history to be carried off the field on his teammates' shoulders.

Photo courtesy of Naval Historical Center



Investigating the *Hunley*

Civil War Confederate submarine CSS *H.L. Hunley* conservators Philippe de Vivies, left, and Paul Mardikian remove the first section of the crew's bench at the Warren Lash Conservation Lab in the former Charleston Navy Shipyard, S.C. Archaeologists and conservators are hopeful that once the bench is removed, they will discover new *Hunley* artifacts. The *Hunley* sank on Feb. 17, 1864, just outside the port of Charleston after torpedoing and sinking the USS *Housatonic*, making *Hunley* the first submarine to successfully conduct a submerged attack.



USS *Alexandria* Completes Circumnavigation of the Globe

by Submarine Base New London Public Affairs

The *Los Angeles*-class attack submarine USS *Alexandria* (SSN-757) returned to Naval Submarine Base (SUBASE) New London Dec. 10 following a deployment that circumnavigated the globe.

Alexandria departed SUBASE June 11, and transited under the Arctic ice to the Pacific Ocean. While this is the first transit of this type for an improved *Los Angeles*-class submarine, USS *Nautilus* (SSN-571) was the first submarine to make such a transit, going from the Pacific to Atlantic Ocean in 1958. On the golden anniversary of that ship's commissioning, that feat held the fascination of *Alexandria*'s captain during his own transit.

"I kind of kept tabs of their track," said CDR Thomas Kearney, *Alexandria*'s commanding officer. "I don't know the exact speed that they went, but I think we beat their speed record and we'll have one of the fastest under-ice transits ever."

After entering the Pacific Ocean, the crew enjoyed port visits in Japan, Singapore, and Guam, intermixed with their training and operations. It was in Guam where some crew members had the opportunity to reunite with their spouses. The spouses who flew out to meet their husbands followed virtually the same path as the submarine.

"That was exciting that the submarine went under the North Pole and we went over it," said Lorene Hendricks, wife of MMC(SS) Steven Hendricks.

"It was nice to have that break in the



Indian Naval officer Lt. Cmdr. Amarjeet Saluja, left, an anti-submarine warfare specialist aboard the Indian Navy frigate INS *Betwa* (F-32), discusses underway replenishment procedures with BMC Ricky Cambridge, assigned to the guided missile frigate USS *Gary* (FFG-51). *Gary*, along with the guided missile cruiser USS *Cowpens* (CG-63) and the attack submarine USS *Alexandria* (SSN-757), took part in exercise Malabar 04 with the Indian Navy.

deployment so we could see each other," said Emily Thompson, wife of MMC(SS) Gary Thompson. "The weather and island were beautiful. We went snorkeling out in the coral reefs. I've never done that before."

After the reunions and port visit in the Pacific were complete, *Alexandria* continued on with her circumnavigation of the globe. They joined the Yokosuka, Japan-based USS *Cowpens* (CG-63) and USS *Gary* (FFG-51) in a port visit in Goa, India, before participating in Exercise Malabar with the Indian navy.

Exercise Malabar is a bilateral exercise designed to increase interoperability between the two navies while enhancing the cooperative security relationship between India and the United States. The at-sea training included maritime interdiction, surface events, sub-surface, and air events, as well as personnel exchanges.

"Exercise Malabar was great," Kearney said. "We sailed around with three Indian ships and one Indian submarine and did a bunch of different exercises with them. They were a very professional navy and very interested in how we do business."

Alexandria's crew also hosted an Indian commander for some of the exercises during Exercise Malabar.

"At the end, I asked him what it was like to be on a submarine," Kearney said. "He said the only words he could come up with

were, 'It's as if I have gone to the moon.'"

Alexandria also made history by becoming the first U.S. nuclear-powered submarine to make a port call in Goa, India.

"I got a lot of 'Hunt for Red October' comments while we were there," Kearney said. "That was their (Indians') perspective of submarines. We gave them a tour of the submarine while we were in India, and they were just blown away."

After completing Exercise Malabar and their port visit in India, *Alexandria* transited through the Red Sea, Suez Canal and Mediterranean Sea, with stops in Crete and Rota, Spain, then home to SUBASE.

"The trip was long, but it was cool because I got to see a lot of different places," said ET2(SS) Scott Carrington. "But this is definitely the best port to come into, and it's good to be home."

After the deployment was over, *Alexandria* had steamed 37,175 miles in 180 days.

"It highlights the technological marvels that these submarines are," Kearney said. "The fact that I can take a submarine from Groton, Connecticut, and be in Japan in less than 30 days and ready to work says a lot. In the six months we were gone, we had 24 dedicated maintenance days and that's it. So the ship is running fabulous and we're ready to go again...shipwise. Peoplewise, we're ready to stay home for a while."



Commanding Officer, USS *Alexandria* (SSN-757), CDR Thomas Kearney, directs the movement of his submarine into the southwestern Indian port of Goa.



Special Recognition

LTJG Gabriel Alvilcar, USS *Seawolf* (SSN-21) and LT Mathias Vorachek, USS *Henry M. Jackson* (SSBN-730) have been recognized as 'New Faces of Engineering' by National Engineers Week for 2005. This recognition program aims to boost public awareness of the role of engineering in America, as well as giving some much deserved recognition to outstanding young engineers. LTJG Alvilcar and LT Vorachek are featured on the National Engineers Week Web site at www.eweek.org/ under the New Faces of Engineering Program. LTJG Alvilcar was also featured in *USA Today*. Congratulations to both of these young leaders in our Submarine Force.

Changes of Command

COMSUBDEVRON-12
CAPT John Richardson relieved
CAPT Frank Caldwell Jr.

USS Columbia (SSN-771)
CDR Eugene Sievers relieved
CDR Duane Ashton

USS Virginia (SSN-774)
CDR Todd Cramer relieved
CAPT David Kern

USS Minneapolis-St. Paul (SSN-708)
CDR Edwin Ruff Jr. relieved
CDR Dave Ratte

USS Tennessee (SSBN-734)(B)
CDR Dennis White relieved
CDR James Hertlein

USS Georgia (SSGN-729)
CDR Rodney Hutton relieved
CDR John Tammen

USS Houston (SSN-713)
CDR John Zavadil relieved
CDR Christopher Kaiser

USS Nebraska (SSBN-739)(G)
CDR Geoffrey Debeaclair relieved
CDR Christian Haugen

USS Newport News (SSN-750)
CDR Matthew Weingart relieved
CDR Fred Capria

USS Seawolf (SSN-21)
CDR R. Scot Hopkins relieved
CDR Paul Stevens

USS Albany (SSN-753)
CDR Mark Merrick relieved
CDR Brett Genoble

ARCO (ARDM-5)
LCDR Edward Hogan relieved
CDR Peter Thomas

NR-1
LCDR Enrique Panlilio relieved
CDR Dennis McKelvey

Qualified for Command

LCDR Michael Ansley
USS Alaska (SSBN-732)(B)

LCDR Michael Boone
USS Alexandria (SSN-757)

LCDR Douglas Bradley
COMSUBRON 7

LCDR Matthew Burton
USS Kentucky (SSBN-737)(G)

LCDR Thomas Bushaw
COMSUBRON 2

LCDR Daniel Caldwell
USS Wyoming (SSBN-742)(B)

LCDR Bruce Carlton
COMSUBRON 15

LT Brandon Christensen
USS Portsmouth (SSN-707)

LCDR Michael Conner
COMSUBRON 15

LCDR Mark Cooper
USS Salt Lake City (SSN-716)

LCDR Eric George
COMSUBLANT

LCDR In Ha
COMSUBRON 15

LCDR Robert Hanna
SUBDEVRON 12

LCDR Andrew Hertel
USS Greenville (SSN-772)

LCDR Aaron Holdaway
COMSUBGRU 7

LCDR Jack Houdeshell
USS Toledo (SSN-769)

LCDR Geoffrey James
ASDS PLTN 1

LCDR Thomas Kierstead
USS Columbus (SSN-762)

LCDR Andrew Miller
USS Maine (SSBN-741)(G)

LT Matthew Miller
USS Henry M. Jackson (SSBN-730)

LCDR James Minyard
USS Alabama (SSBN-731)(B)

LCDR Jon Moretty
USS Pennsylvania (SSBN-735)(G)

LCDR Matthew Mulcahy
COMSUBRON 4

LCDR Kevin Mullaney
USS Helena (SSN-725)

LCDR Paul Nitz
COMSUBGRU 9

LCDR Nathaniel Reed
USS Salt Lake City (SSN-716)

LCDR Barry Rodrigues
USS Pennsylvania (SSBN-735)(G)

LCDR Robert Sanders
USS Alabama (SSBN-731)(B)

LCDR Axel Spens
USS La Jolla (SSN-701)

LT Rob Stevenson
USS Rhode Island (SSBN-740)(B)

LCDR Lance Thompson
USS Rhode Island (SSBN-740)(G)

LCDR Michael Toepper
USS Greenville (SSN-772)

LCDR Michael Ward
USS Hampton (SSN-767)

LCDR Christian Williams
USS Chicago (SSN-721)

Line Officer Qualified in Submarines

LTJG Patrick Alfonso
USS Asheville (SSN-758)

LTJG Vernon Bachmann
USS Charlotte (SSN-766)

LTJG Scott Becker
USS Asheville (SSN-758)

LTJG Brandon Bell
USS City of Corpus Christi (SSN-705)

LTJG Brendon Bielat
USS Albuquerque (SSN-706)

LTJG Christopher Carter
USS Minneapolis-St. Paul (SSN-708)

LTJG Ryan Carter
USS Connecticut (SSN-22)

LTJG Joshua Chisholm
USS San Francisco (SSN-711)

LT Joshua Collins
USS Asheville (SSN-758)

LTJG Marshall Croft
USS Tennessee (SSBN-734)(B)

LTJG Keith Davidson
USS Columbus (SSN-762)

LTJG Brandon Deshaw
USS Honolulu (SSN-718)

LTJG Tomasz Dmitrukowski
USS Alabama (SSBN-731)(G)

LTJG Jeffrey Fassbender
USS Annapolis (SSN-760)

LTJG Christopher Fendley
USS Tucson (SSN-770)

LTJG Daniel Fox
USS Pennsylvania (SSBN-735)(G)

LTJG Jeremiah Fulton
USS Olympia (SSN-717)

LTJG William Gardner
USS Olympia (SSN-717)

LTJG James Grant
USS Nebraska (SSBN-739)(G)

LTJG Richard Gripshover
USS Albany (SSN-753)

LTJG Derek Grossman
USS Maine (SSBN-741)(G)

LTJG Nicholas Herman
USS Alabama (SSBN-731)(G)

LTJG Kurtis Kaun
USS Key West (SSN-722)

LTJG Bradley Krack
USS City of Corpus Christi (SSN-705)

LTJG David Lewis
USS Honolulu (SSN-718)

LTJG Jason Lewis
USS Rhode Island (SSBN-740)(B)

LTJG Charles Litton
USS Tucson (SSN-770)

LTJG Angel Martinez
USS Salt Lake City (SSN-716)

LTJG Desir Martial
USS Pennsylvania (SSBN-735)(B)

LTJG Matthew Merten
USS Michigan (SSGN-727)

LTJG Joshua Mock
USS Houston (SSN-713)

LTJG Kent Moss
USS Charlotte (SSN-766)

LT Nathan Mote
USS Nebraska (SSBN-739)(G)

LTJG Joshua Nevin
USS Salt Lake City (SSN-716)

LTJG Brian Padworny
USS Memphis (SSN-691)

LTJG Charles Phillips
USS Pasadena (SSN-752)

LTJG Sean Ponder
USS Salt Lake City (SSN-716)

LTJG Michael Poplawski
USS Pennsylvania (SSBN-735)(B)

LTJG Sean Prevo
USS Alabama (SSBN-731)(G)

LTJG Daniel Race
USS Olympia (SSN-717)

LTJG Bryan Rowe
USS Tennessee (SSBN-734)(B)

LT Joseph Saur
USS Charlotte (SSN-766)

LTJG Nathan Spurgeon
USS Alabama (SSBN-731)(G)

LT John Stevenson
USS Los Angeles (SSN-688)

LT Thomas Stone
USS Annapolis (SSN-760)



LTJG Danny Stubbs
USS Houston (SSN-713)

LTJG Chad Summe
USS Topeka (SSN-754)

LTJG Ryan Tashma
USS Albuquerque (SSN-706)

LTJG Stephen Thompson
USS Key West (SSN-722)

LTJG John Thorpe
USS Pennsylvania (SSBN-735)(G)

LTJG Luke Vriezen
USS Virginia (SSN-774)

LTJG Andrew Waldmann
USS Virginia (SSN-774)

LTJG Andrew Ward
USS Tucson (SSN-770)

LTJG Justin Westfall
USS Rhode Island (SSBN-740)(G)

LTJG Christopher Whitley
USS Minneapolis-St. Paul (SSN-708)

LTJG Philip Yi
USS Alabama (SSBN-731)(G)

Limited Duty Officer/Chief Warrant Officer Qualified in Submarines

LTJG Steven Chmielewski
USS San Francisco (SSN-711)

CWO2 Joseph Mancuso
USS Nevada (SSBN-733)(B)

Qualified Nuclear Engineer Officer

LTJG Michael Austin
USS Nebraska (SSBN-739)(B)

LTJG David Bailey
USS Topeka (SSN-754)

LTJG Charles Balka
USS Topeka (SSN-754)

LTJG Brett Bateman
USS Henry M. Jackson (SSBN-730)

LTJG Jeremy Biediger
USS Alaska (SSBN-732)(G)

LTJG Nicholas Borman
USS Olympia (SSN-717)

LTJG James Braunwarth
USS Houston (SSN-713)

LTJG Peter Butville
USS Greenville (SSN-772)

LTJG Gregory Cizin
USS Alabama (SSBN-731)(B)

LTJG Nicholas Coons
USS Henry M. Jackson (SSBN-730)

LT Brian Earp
USS Nevada (SSBN-733)(B)

LTJG Thomas Finley
USS Key West (SSN-722)

LTJG Eugene Gard
USS Bremerton (SSN-698)

LTJG Carlos Gomez
USS Buffalo (SSN-715)

LTJG Christopher Hall
USS Topeka (SSN-754)

LTJG William Harley
USS Columbus (SSN-762)

LTJG Nicholas Hill
USS Nebraska (SSBN-739)(B)

LTJG Keith Hout
USS Alaska (SSBN-732)(G)

LTJG David Hudson
USS Santa Fe (SSN-763)

LTJG Eric Hunter
USS Santa Fe (SSN-763)

LTJG Corey Johnson
USS Houston (SSN-713)

LT Jonathan Kim
USS Topeka (SSN-754)

LTJG Adam Kuehne
USS Pennsylvania (SSBN-735)(G)

LTJG Matthew Luff
USS Nevada (SSBN-733)(B)

LTJG Matthew Maassen
USS Alaska (SSBN-732)(G)

LTJG Elvin Monzon
USS Asheville (SSN-758)

LTJG Norman Overfield
USS Kentucky (SSBN-737)(B)

LTJG Brian Peithman
USS Henry M. Jackson (SSBN-730)

LTJG Weylin Piegorsch
USS Olympia (SSN-717)

LTJG Brandon Rapp
USS Buffalo (SSN-715)

LTJG Earon Rein
USS Topeka (SSN-754)

LT Kenneth Rogers
USS Alaska (SSBN-732)(G)

LTJG John Seguin
USS Key West (SSN-722)

LTJG Ryan Tregre
USS Santa Fe (SSN-763)

LTJG Artvel Tyson
USS Chicago (SSN-721)

LTJG Steven Vancott
USS Columbia (SSN-771)

ADM William J. Fallon assumed command of U.S. Pacific Command

by Army Staff Sgt. Bryan Beach, U.S. Pacific Command Public Affairs



ADM William J. Fallon assumed command of U.S. Pacific Command (PACOM) from ADM Thomas B. Fargo at PACOM headquarters Feb. 26.

During the change of command ceremonies, Chairman of the Joint Chiefs of Staff Air Force Gen. Richard B. Myers, who officiated at the ceremony, presented PACOM with the Joint Meritorious Unit Award.

"It's because of the efforts of the men and women of the U.S. Pacific Command that today, millions of people in the Middle East and around the world now have a choice," said Myers. "In the global war on terrorism, PACOM has met and conquered great challenges across great distances."

Fallon, whose most recent assignment was commander of U.S. Fleet Forces Command and U.S. Atlantic Fleet, is the 21st commander of U.S. Pacific Command.

As the senior U.S. military commander in the Pacific and Indian Ocean areas, Fallon leads the largest of the unified commands and directs Army, Navy, Marine Corps, and Air Force operations across more than 100 million square miles. He is responsible to the President and the Secretary of Defense through the Chairman, Joint Chiefs of Staff and is the U.S. military representative for collective defense arrangements in the Pacific.

LTJG Kristofer Westphal
USS Asheville (SSN-758)

LTJG Michael Winn
USS La Jolla (SSN-701)

LT Joshua Wood
USS Jefferson City (SSN-759)

LTJG Kurt Young
USS Henry M. Jackson (SSBN-730)(G)

Supply Officer Qualified In Submarines

ENS Eric Coomes
USS Columbia (SSN-771)

LTJG Blaine Garrison
USS Minneapolis-St. Paul (SSN-708)

ENS Juan Gonzalez
USS Santa Fe (SSN-763)

LT Jimmy Karam
USS Ohio (SSGN-726)

LTJG David Ozeck
USS Charlotte (SSN-766)

ENS John Tamez
USS Tennessee (SSBN-734)(B)

LTJG Nicholas Ulmer
USS Pasadena (SSN-752)

Qualified Docking Officer

LTJG Stanley Fleming
USS Arco (ARDM-5)

Change of Homport

USS Houston (SSN-713) arrived at its new homeport in Guam on 24 December 2004.



Total Force Conference Zeroes in on Reserve Support to Submarine Force Goals

by JOC Mark O. Piggot, COMSUBLANT Public Affairs

Over 130 active duty and reserve submariners met in Norfolk in February to plan the future of reserve submarine support at the 2005 Total Force Conference, sponsored by Commander, Submarine Forces Atlantic.

This year's conference, entitled "One Team: Mission Execution," was designed to further improve active-reserve component integration by providing a forum for interaction, information exchange, and joint planning for future operations.

"The Submarine Force could not have had such a successful year without reserve component support," said RADM James E. Beebe, Director, Submarine Reserve. "Eighty-two percent of submarine reserve support this past year was focused on the operational output of the Submarine Force, which is really quite fantastic."

VADM Chuck Munns, COMNAV-SUBFOR, praised the reserve component for this great contribution to what he calls his top goal: maximized operational availability of submarines at sea to combatant commanders.

"We, the Submarine Force, are in the right place, doing the right thing," Munns said. "In 2004, submarines deployed worldwide, operating in every area of responsibility, surging when needed to meet national security requirements and other missions in support of the global war on terrorism. Such accomplishments required the team effort of all those in the undersea enterprise."

In addition to deploying ready submarines to sea globally, other top goals of the submarine force are: to improve decisions of commanding officers and facilitate the ability of those crews to act on those decisions; to put the right people in the right jobs; and finally, to provide adequate future force capability using advanced technology.

"The submarine reserve is constantly assessing and adjusting to ensure it is properly aligned to be the most effective and efficient force multiplier and risk mitigator in enabling the submarine total force to deliver its four major outputs," said

Photo by J0SN Andy Zask



RADM Jay DeLoach (left), Deputy Commander, Submarine Forces, U.S. Atlantic Fleet, introduces VADM Chuck Munns, Commander Naval Submarine Forces, at the 2005 Total Force Conference. This year's conference, entitled "One Team: Mission Execution", was designed to further improve active component-reserve component integration by providing a forum for interaction, information exchange, and joint planning for future operations.

RADM Jay DeLoach, deputy commander SUBLANT.

The Submarine Force reserve component plays a significant role in daily operations of the force by providing contributory support in the form of two-week annual training, weekend drills, and other special active duty periods.

DeLoach noted, "The reserve component provided over 62,000 days of operational support to the SUBFOR commands in fiscal year 2004. This support filled critical capability gaps during surge operations in such areas as strike group submarine advisory team support, force protection, watch standing, and maintenance."

"Our reservists deployed on every carrier during Summer Pulse '04," he continued. "They also played a significant role in support of exercises 'Silent Hammer', 'Terminal Fury', 'Annulex' and 'Smart Search.' Every major exercise in the Submarine Force uses reserve support — that is how well integrated we are."

"We, the Submarine Force, are in the right place, doing the right thing."

— VADM Munns,
Commander Naval
Submarine Forces

USS *Olympia* deploys with USS *Carl Vinson* strike group



(above) Sailors aboard USS *Olympia* (SSN-717) prepare to get underway for a Western Pacific deployment. The nuclear-powered attack submarine joined the USS *Carl Vinson* (CVN-70) Strike Group.

(below) Sailors from *Olympia* and *Mustin* work to clear the Sugar King Estate.



USS *Olympia* (SSN-717) departed for a six-month Western Pacific deployment from its homeport of Pearl Harbor on Feb. 7.

The nuclear-powered attack submarine will join the USS *Carl Vinson* (CVN-70) Strike Group heading into the Western Pacific.

According to CAPT David Marquett, COMSUBRON-3, *Olympia* spent more time at sea preparing for the deployment than normal. “*Olympia* is associated with the *Carl Vinson* Strike Group, so during the work-up *Olympia*’s crew was required to participate in exercises with the strike group in San Diego including Composite Training Unit Exercise (COMPTUEX) and Joint Task Force Exercise (JTFEX),” said Marquett.

On Feb. 23, more than 40 crewmembers from *Olympia* and USS *Mustin* (DDG-89) spent the day cleaning, clearing, and trimming the Sugar King Estate, a World War II memorial site in Saipan.

To commemorate the event, Saipan Mayor Juan Tudela awarded plaques to the two commanding officers, CDR Paul Marconi of *Olympia* and CDR Mike Ford of *Mustin*. Tudela also gave plaques to the leaders of the crewmembers who participated.

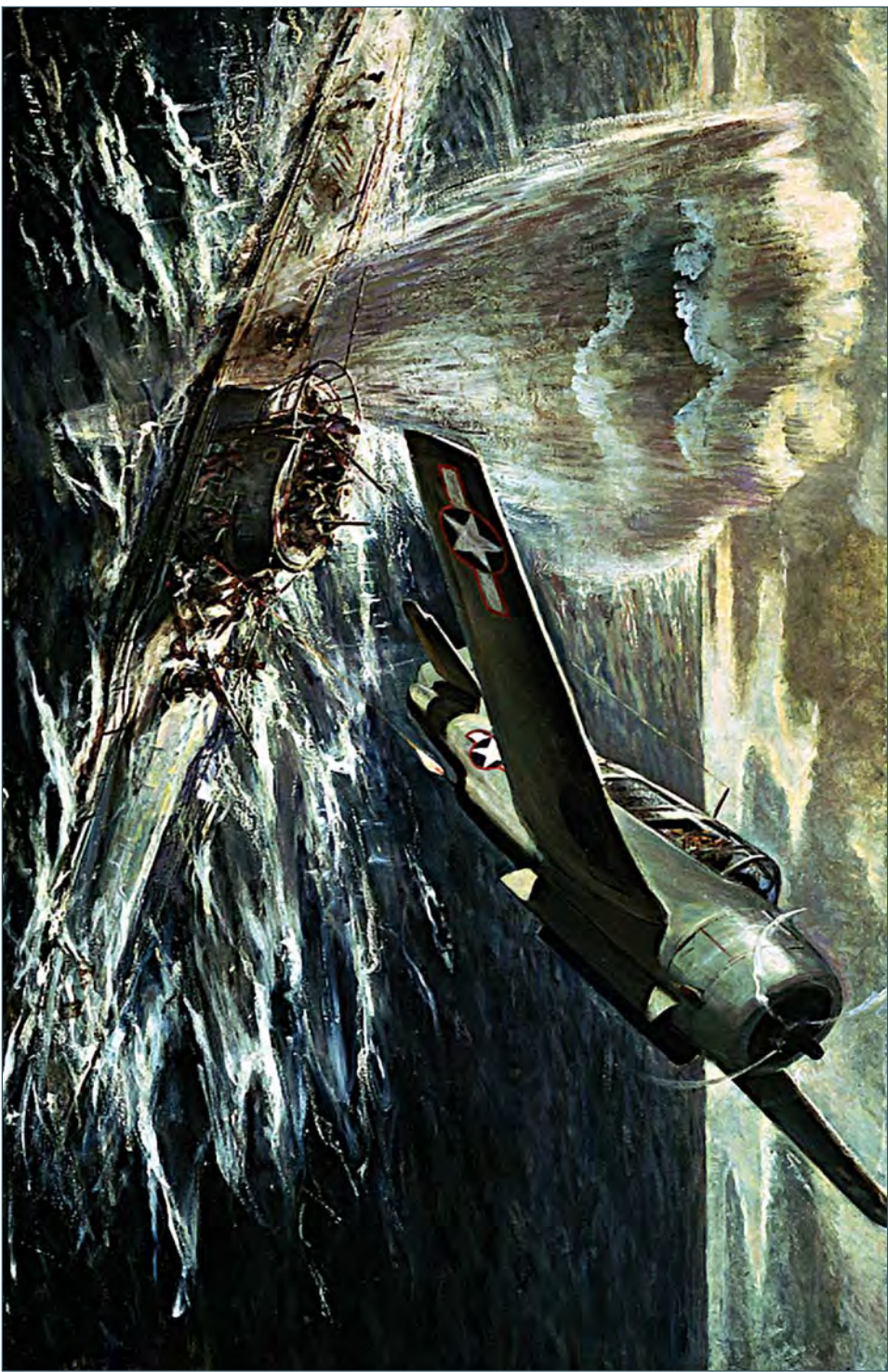
On The Back



“The Kill” by Robert Benny. In this dramatic presentation of a sea-sky battle, a Grumman Avenger torpedo bomber, bomb bay doors open, leaves death in its wake as it zooms away from a conclusive attack on a surfaced enemy submarine. All the vivid action in this scene was repeated many times in actual combat by U.S. Navy airmen. Navy planes from escort aircraft carriers wreaked havoc on submarine wolf packs attacking Atlantic convoys, and they virtually blasted them from the ocean for many months. Bombers were fitted with depth charges, one of which is pictured exploding off the U-boat’s beam here. In the attack, the plane’s rear “stinger” gun spits death at gun crews attempting to ward off these lethal hawks from the sky.

Born in New York City in 1904, Robert Benny studied at some of the city’s most prominent art schools before opening his own studio at the age of 19. In 1943 Abbot Laboratories hired him to work on paintings depicting the Naval Aviation Department’s role in the major battles of the Pacific. In 1968, he offered his services as a war correspondent and served with the Marines in Vietnam. Benny’s work can be found in the permanent collections of the Smithsonian and the Franklin D. Roosevelt Library; his artwork is also held in the Combat Art collections of the U.S. Army, Navy, Marine Corps, and Air Force.





“The Kill”

by Robert Benny